JANUARY 20, 1957

electronics

business edition

A McGRAW-HILL PUBLICATION · VOL. 30, NO. 18 · PRICE FIFTY CENTS

SIMON RAMO and DEAN WOOLDRIDGE, architects of Intercontinental Ballistic Missile

NEWS AT A GLANCE

MISSILES CONTROL 50% OF DEFENSE WORK AS . . . Two dozen projects approach production phase; component reliability is key to success (page 13)/Survey reveals advancement opportunity is major factor when engineers change jobs (page 17)/Corporate research directors disclose yardsticks for determining how much basic research is needed (page 20)/Air Force readies test and training site as $\frac{1}{4}$-billion ICBM nears completion (page 30)

U S POWER
UNIVERSITY MICROFILMS IN
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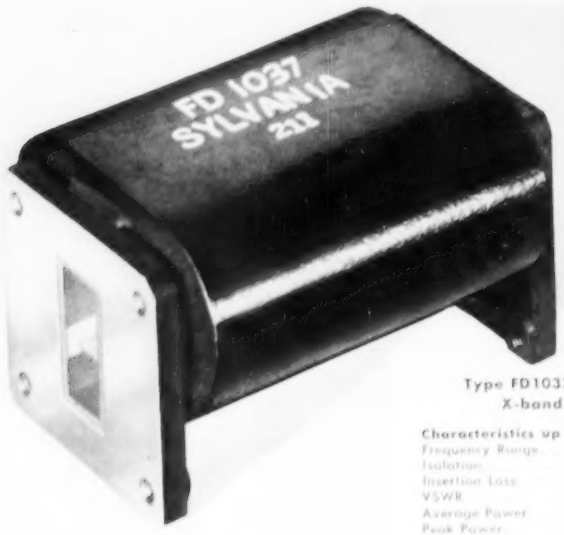
Sylvania implements microwave's newest circuit concept with a full line of—



Type FD1037—a 3" broad band X-band ferrite isolator

Characteristics up to 125° C. Ambient Temp.:

Frequency Range	8500 to 9600 mc.
Isolation	25 db Min.
Insertion Loss	1 db Max.
VSWR	1.13 to 1
Average Power	100 W Max.
Peak Power	125 KW Max.

High performance ferrite isolators

FERRITE ISOLATORS increase the reliability of microwave system performance by protecting the microwave power source from other transmission line components' energy reflections.

Sylvania is a leading exponent of this new microwave concept and offers the microwave designer a line of high performance isolators which are the products of a completely integrated program of ferrite research and development.

Research in ferrite *materials* is carried out in Sylvania's Chemistry Laboratory, in Flushing, New York.

To this, Sylvania adds basic research on ferrite *devices* at its Microwave Physics Laboratory, in Mountain View, California.

The developments of these separate programs are integrated into Sylvania's experienced microwave product design and production at Woburn, Massachusetts.

The result . . . a full line of high performance quality ferrite isolators which provide the designer with means for new and improved microwave systems.

Type FD1013—2" broad band X-band isolator

Characteristics up to 125° C. Ambient Temp.:

Frequency Range	8500 to 9600 mc.
Isolation	10 db Min.
Insertion Loss	0.6 db Max.
Average Power	100 W Max.
Peak Power	100 KW Max.

Type FD977—5" C-Band Isolator for Airborne Weather Radar

Frequency	5400 mc. ± 30 mc.
Isolation	15 db Min.
Insertion Loss	1 db Max.
Average Power	125 W Max.
Peak Power	125 KW Max.

Low Power Types for Microwave Link Applications

Type FD962	7.1 to 8.0 kmc. Isolation 35 db Min.
Type FD963	4.5 to 5.0 kmc. Isolation 25 db Min.
Average Power	20 W Max.
Insertion Loss	1 db Max.

For complete details and specifications on these Ferrite Isolators, write Dept. A-20-R.

SYLVANIA

SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N. Y.
In Canada: Sylvania Electric (Canada) Ltd.
Shell Tower Building, Montreal

LIGHTING · RADIO · TELEVISION · ELECTRONICS · ATOMIC ENERGY

electronics
business edition

A McGraw-Hill Publication
Vol. 30, No. 18

JANUARY 20, 1957

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Industry Outlook

DEVELOPING, manufacturing and servicing electronic equipment for the Armed Forces is the largest single segment of our industry. Spending for defense electronics in 1957 will reach $3.1 billion. Conservative estimates predict a 10-percent increase in spending during each succeeding year.

- Guided missile programs take nearly 50 percent of the defense electronics dollar. Major programs involve inertial and celestial automatic navigation systems.

- Aircraft armament business now accounting for 17 to 20 percent of the defense electronics dollar is changing. Emphasis is shifting away from interceptor aircraft. Long-range bombers remain an important item.

- Electronic countermeasures assume new importance in pushbutton warfare.

- Emphasis in ground equipment is switching from radar detection apparatus to air-defense computers.

- A quiet crash program in underwater detection gear has brought about advances that make 450 potentially hostile submarines look a little less menacing.

Neither developments abroad nor the political situation at home indicate any decrease in the defense electronics business. Research & development and production contracts will retain their relative shares of the business. High creativity and manufacturing skill will be prerequisites for successful competition for the defense dollar.

▼

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electronics march technical

It's the first IRE Show in New York's Coliseum and attendance will be the biggest ever. Everyone with a stake in the electronic industry will be there March 18th to 21st for the 1957 edition of the Institute of Radio Engineers Show. Engineer or salesman, electronic designer, technician, manufacturer . . . they'll be there to see the latest equipment, circuitry, components and materials.

And before the big show, every important man in the electronic field will be studying the March 1st Technical Edition of ELECTRONICS . . . and buying from its advertising pages.

visit your electronics representative at booth . .

edition is the big IRE Show Issue

This pre-show issue is important to the entire industry.

Exhibitors insure wide attendance at your IRE Show booth through the advertising pages of the March Technical Edition of ELECTRONICS. Show off your new products and preview your IRE booth in your selling message. Now is the time to make advertising space reservations for this all-important issue which will be referred to before and during attendance at the exhibit and throughout the year.

For non-exhibitors, this carefully-read March Technical Edition of ELECTRONICS can describe your products . . . for it is a "show in print." This issue of ELECTRONICS has firmly established itself as the important convention publication . . . the product show place in conjunction with the IRE Show. Consistent increases in the amount of advertising space in this pre-show issue from year to year prove this is the way for exhibitors and non-exhibitors to reach the entire industry at show time.

You cannot afford to miss this important issue. Closing date for the March 1st Technical Edition of ELECTRONICS is February 1st for complete plates; January 25th for copy to set.

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electronics

A McGRAW-HILL PUBLICATION, 330 WEST 42ND STREET, NEW YORK 36, N. Y.

Just announced!

-hp- X365A Isolator

Broadband X-band ISOLATOR

covers 8.2 to 12.4 KMC

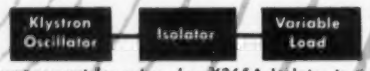
One Isolator for entire X-band! Maximum forward attenuation 1.5 db; at least 25 db reverse attenuation! Low 1.2 SWR! Models for other bands coming soon!

No longer must you buy expensive narrow-band Isolators for every frequency band you work with. The new *-hp-* X365A is a true broadband Isolator—one precision instrument giving you almost flat rejection over the entire X-band.

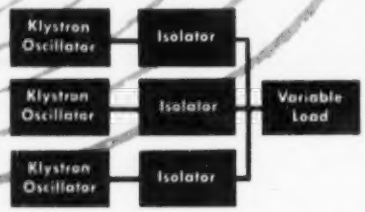
-hp- X365A employs the Faraday principle of field rotation. Two axially magnetized ferrite rods mounted inside a round, vaned waveguide, rotate the planes of polarization 45° each. This rotation, in combination with precisely located attenuator cards, permits forward power to pass almost without loss, while reverse power is virtually cancelled out.

-hp- X365A Isolators are precisely machined and finished, yet ruggedly constructed of top quality materials. *-hp-* 365A series Isolators for other waveguide bands will be announced soon.

TYPICAL APPLICATIONS



Arrangement for using *-hp-* X365A Isolator to prevent shifting of klystron oscillator frequency due to load variations.



Arrangement for using *-hp-* X365A Isolator to prevent mutual coupling of klystron oscillators.

BRIEF SPECIFICATIONS

Frequency Range:	**8.2 to 12.4 KMC**
Minimum Reverse Attenuation:	**25 db**
Maximum Forward Attenuation:	**1.5 db**
Maximum SWR (either end):	**1.2**
Maximum Power Dissipation:	**5 watts**
Overall Length:	**9¾"**
Price:	**$225.00**

Specifications subject to change without notice. Price f.o.b. factory.

Get Details from Your *-hp-* Representative, or Write Direct!

HEWLETT-PACKARD COMPANY

3808A Page Mill Road, Palo Alto, Calif., U.S.A.
Cable "HEWPACK" DAvenport 5-4451

Field engineers in all principal areas

Complete coverage in waveguide equipment, too!

JOINT ventures grow

Twin gains spark movement
One firm has engineers
The other has marketing skill

DESIRE to participate more broadly in new industrial developments is currently sparking joint corporate venture movements. These ventures have been particularly attractive to companies in electronics. The venture mechanism is a special-purpose corporation, jointly owned and directed by the participants.

Royal Precision, formed by Royal McBee and General Precision; Datamatic, formed by Minneapolis Honeywell and Raytheon; Intercontinental Electronics, formed by the CSF group of French electronic firms and Airborne Instruments illustrates some of the motives for establishing joint companies.

One common theme underlies most joint ventures. By combining abilities, knowledge and resources, participating companies can share in difficult and expensive development work that they are unable or unwilling to undertake alone.

Good example of simplicity and effective utilization of participating company facilities is Royal Precision. General Precision, experienced in computer construction through military work, lacked a marketing organization needed to develop the civilian computer market. McBee had a complete civilian marketing organization but no background in electronic production.

Datamatic was also formed to exploit opportunities in the growing computer market. A union of special technical and production knowledge marked this venture.

Intercontinental Electronics is an international venture for wider use of French electronic advances.

Joint corporate ventures and mergers are related. The desire to participate, through corporate combination, in new and technically advanced industrial developments marks both movements. One interesting difference is that joint corporate ventures do not come under the merger limitation provisions of the Clayton Antitrust Act.

SHARES and PRICES

CAPACITOR production is closely related to future growth of the electronics industry as capacitors are found in all electronics equipment. And capacitor production plans are looking up.

Capacitor production is expected to increase at an even faster rate than the electronics industry as a whole when color tv set production really gets underway.

Today, black and white tv sets use more capacitors than all other electronic equipment combined. But color sets typically require more than two and a half times the number required by black and white sets.

More than one billion capacitors were produced in 1956 and nearly 2 billion will probably be produced in 1960. The dollar value of 1956 capacitor sales is estimated to be well in excess of $120 million.

There are about 140 companies in this field. Some make only one of the 20-odd capacitor varieties while others make 15 or more. A few leading manufacturers with publicly traded securities and whose total operations are significantly affected by the capacitor business are briefly analyzed in the table.

Acquisition and expansion plans were announced late in 1956 by several capacitor manufacturers. Astron, Cornell-Dubilier and Sprague figured in purchase plans for other capacitor companies, while Erie Resistor announced plans to build a new plant.

However, 1956 earnings of the group ran behind 1955. Sprague has announced that its 1956 earnings will be less than 1955 because of a developmental program. Aerovox and Pyramid had deficits in the first six months; Pyramid's showing reflected large non-recurring write-offs.

Capacitor Manufacturers	Recent Price	1956 Dividends	Percent Yield	Earned Per Share 1956	Earned Per Share 1955	Traded	1956 Price Range
Aerovox	4⅛*	—	—	d-0.04 (6 mos)	0.55	OTC	4 – 8⅜
Astron	3½*	0.40	11.4	0.27 (9 mos)	0.46	OTC	3 – 4⅜
Cornell-Dubilier	26½	1.40	5.3	1.32 (9 mos)	3.41	NYSE	25 – 40⅛
Erie Resistor	20¾*	1.20	5.8	1.29 (24 wks)	3.19	OTC	16 – 24
Pyramid Electric	2¾*	—	—	d-0.25 (6 mos)	0.15	OTC	2¾ – 6½
Radio Condenser	5¼*	0.10	1.9	**	1.29	OTC	5 – 7
Sprague Electric	32½*	1.20	3.7	0.83 (6 mos)	2.42	OTC	32 – 54

*bid prices supplied by NASD and individual brokers **—not available d—deficit

Building plants without MONEY

TWENTY YEARS AGO if you needed a new plant and couldn't dig up the money yourself or borrow it from the bank you probably would have had to postpone your plans until your financial circumstances improved. Today, not only are you able to find others willing to build your plant but you may have difficulty in deciding which offer to select.

Legislatures of 10 states, including all of New England, New York, Pennsylvania, Kansas, North Carolina and Florida have state development credit corporations. In addition there are hundreds of community sponsored industrial foundations.

Many groups find small electronics plants especially attractive because of their growth potential and because they permit an area to become industrially diversified for greater economic stability.

The big growth of planned industrial districts or parks came in the post-war period. At present, more than 100 of these planned districts are to be found from coast to coast.

Some, like Roosevelt Field in Long Island and the Vina Vista district in San Bernardino, will construct a plant for lease to the prospective tenant, while others merely provide assistance in financing. Electronic firms among tenants at Roosevelt Field include American Bosch Arma, Reeves Instrument and a division of Sperry Rand.

Newest and most complex of the methods for obtaining a plant without capital is the sale and lease-back method. Here a corporation sells its plant to real-estate investors, usually through a broker who arranges the deal; and the investors promptly give the corporation a long-term lease on the plant. The investors are usually insurance companies, pension and endowment fund and private real-estate investors.

The investor gets a 7 to 10 percent return on his money. The owner gets the use of capital which has heretofore been tied up in his plant. In addition, he gets a tax saving because all of his lease payment is deductible compared with an average deductible depreciation of three percent.

Recently, Penn-Texas, active in electronics through ownership of Hallicrafters, received about $11,000,000 from the sale of its Pratt & Whitney division plant in West Hartford, Conn., and leased it back for 31 years with the option of renewals up to 91 years. GE and IBM also have made use of lease-back operations.

MERGERS, ACQUISITIONS and FINANCE

Interstate Engineering, El Segundo, Calif. has purchased **Hadco Engineering** and Hadco's subsidiary, **General Wheels.** The purchase was made by means of a tax-free exchange of stock on a basis roughly approximating book value.

Norris-Thermador has acquired **North American Instruments,** Altadena, Calif. More than 80 percent of the electronics firm's outstanding stock was purchased for cash.

AMP, formerly Aircraft-Marine Products, recently offered through Kidder, Peabody & Co., 277,700 shares of $1 par value common stock at a price of $16.25. About 128,000 shares were sold for the account of the company and the remaining 149,000 shares were offered for the account of stockholders. An additional 30,000 shares of common stock were offered to employees at $15.04 per share.

Van Norman Industries and **Bingham-Herbrand** stockholders have approved the proposed merger of Bingham-Herbrand into Van Norman through an exchange of stock. Stockholders of the merged corporation will receive one share of $2.28 Van Norman convertible preferred stock for each two shares of Bingham-Herbrand. The acquisition will add stamping and drop forged facilities to Van Norman's cutting tool, machine tool and electronics business.

National Cash Register has registered with the SEC a stockholder offering of $28,285,600 convertible subordinated debentures due Dec. 15, 1981. Dillon, Read & Co. will underwrite the issue.

Texas Instruments is selling $10 million in notes to Equitable Life to fall due between 1959 and 1971. About $4 million of proceeds will be used for new construction. Remainder will be used to increase working capital and to refinance mortgage bonds.

Daystrom has announced plans to purchase **Ford Engineering** of Upland, Calif. Daystrom's West Coast unit, Daystrom Pacific, Santa Monica, which manufactures military equipment, will provide technical assistance to the new unit which makes similar precision equipment for commercial users.

Scovill Manufacturing expects to raise $15 million this month through sale of common stock and debentures. Common shares will be offered to stockholders on a basis of not more than one new share for each eight held. Proceeds from the offerings, to be made by a Morgan Stanley underwriting group, will be used to finance expansion and modernization plans.

SYSTEMS AUDIO
Components and Amplifiers

DIGIMAX DIALS, ACCELERATION SENSITIVE SWITCHES, TRANSFORMERS AND AMPLIFIERS

NEW

Digimax Dial

For accurate digital indexing of precision potentiometers to 1 part in 2000.

Featuring:

- 1 1/16" x 1" panel space.
- Direct reading dial 0 to 999.
- Detenting in 1/3-digit increments.
- Adjustable by a gloved operator.

(3/4 actual size)

NEW

Sub-Miniature Servo-Amplifiers

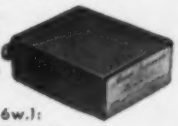
Model 805 Servo Amplifier

Unique vacum tube amplifier providing output up to 5 watts.

- Weight: 4 oz., Dimensions: 1" x 2 1/2" x 3".

Model 800 TRANSISTOR SERVO AMPLIFIER

Designed to drive 400 cps servo motors with stall power requirements of up to 6 watts.



- Weight (for 6w.): 5 oz., Volume: 8 cu. in.

Models 806 and 806-1 SUMMING AMPLIFIERS

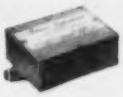
Precisely add or subtract up to 7 input signals. Available with 90° phase shift to drive 2-phase servo motors.

- Weight: 4 oz., Dimensions: 2" x 2" x 1".

NEW

Acceleration Sensitive Switches

Precision, factory-set to close or open at predetermined acceleration levels, 2.5 to 35.0 g, or to specification.



Model 131 — SELF-RESETTING TYPE

Model 132 — MANUAL-RESETTING TYPE

Langevin Transformers

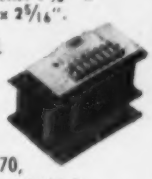
Type L-1620 — COMMERCIAL

- Step-down voltage 115 v. to 16 v.
- 400 cps operation. • Weight 4 oz.
- Dimensions 1 3/8" x 1 1/16" x 1 5/16".

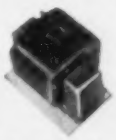
Type L-1505, MIL-T-27A — CLASS A

- Voltage Standard.
- Hermetically sealed.
- 6 windings, 33 terminals.
- Dimensions: 1 5/8" x 1 13/16" x 2 5/16".

Type L-2834 COMMERCIAL



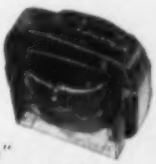
- Saturable reactor.
- Open construction.
- Dimensions: 4" x 4" x 6".



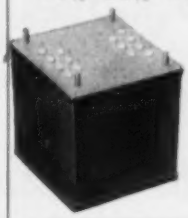
Type L-1570, MIL-T-27A — CLASS B

- Power transformer plate.
- Incapsulated.
- 3 1/8" x 3 1/2" x 3 3/16".

Type L-2769 MCREE-553 — CLASS B



- 6000 v. rms.
- High altitude—low corona.
- Incapsulated.
- 5 7/8" x 6 1/2" x 6 1/8"



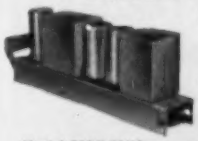
Type L-2562 MIL-T-27A — CLASS A

- Filament transformer.
- Hermetically sealed.
- 2 to 6.3 volts, 10 amps. secondary winding.
- Low temperature rise.
- Dimensions: 5 11/16" x 6 5/16" x 7 1/2".

Langevin Miniature Amplifiers

The accepted standard for network and commercial sound systems. The smallest, high quality amplifiers available to the industry!

Broadcast Amplifiers



Model 5116 PLUG-IN BROADCAST PRE-AMPLIFIER

- Length 9", Width 1 3/8", Height 3".

Model 5117 PLUG-IN BROADCAST PROGRAM AMPLIFIER

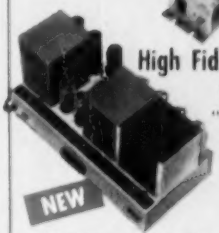
- Length 10 1/4", Width 2 5/8", Height 3".

Industrial Amplifiers

Model 138-G with INTERCHANGEABLE INPUT PANELS

Length 13" Width 3 1/8" Height 5"

High Fidelity Amplifiers



NEW

The COOK-LANGEVIN "Ultimate" AMPLIFIER

- Exceptional Class A power.
- Negligible distortion, low noise.
- Automatic adjustment to speaker imped.
- Low impedance plate load.
- 4—6550's power output tubes.

50 watts over the entire frequency spectrum!

Product of the combined talents of Cook Laboratories and Langevin engineers.

In-plant MIL-T-27A Test Facilities — Langevin has complete in-plant test facilities for transformers in conformity with MIL-T-27A and other government specifications requiring qualification approval. In addition to all required electrical test equipment, these facilities include a temperature and humidity chamber with automatic cycling controls, cold chamber, altitude chamber and vibration table for the specified environmental tests.

CATALOGS ON REQUEST — Call or write for new bulletins.
Please mention products in which you are interested.

MAXSON INSTRUMENTS

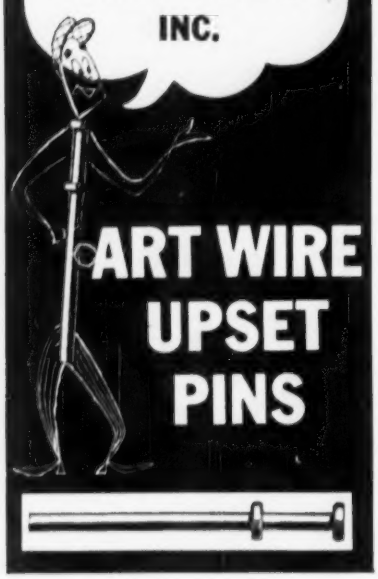
DIVISION OF THE W. L. MAXSON CORPORATION

47-37 Austell Place
Long Island City 1
New York
Tel: RAvenswood 9-1850

"Simplifies assembly... Improves performance"

SAYS:

SARKES TARZIAN, INC.



ART WIRE UPSET PINS

Sarkes Tarzian, manufacturers of television and radio equipment, use Art Wire and Stamping Company's special upset pins because their uniformly high quality eliminates manufacturing problems. They say: "Through the use of this part we have simplified assembly and improved performance."

We supply upset pins of any workable metal or alloy in diameters from .010 to .090. Thickness of upset flange on head from .010 on fine wire to .062 on heavy wire. Flanges precision positioned to your specifications.

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WASHINGTON

Department of Commerce officials estimate total production of electronic equipment and components for the first half of 1957 will be $6 billion, roughly the same as during the first half of last year.

Production of military electronics should increase moderately during the six months just ahead, according to the Department. The increase will come mainly from accelerated production of components and equipment for the missile program, says Donald Parris, of the Electronics Division of Business and Defense Services Administration. This will more than offset declining procurement of other types of military equipment.

On the other hand, Parris forecasts that overall electronics manufacturing and employment will show a seasonal downswing in the first half of 1957 of about the same size as that of last year.

Manufacturers of tv and radio receivers, phonographs and the like are likely to cut back their output during the months just ahead even more than a year ago because of peak inventories carried over by both retailers and wholesalers. Sales of color tv sets aren't likely to be large enough to offset this decline.

Factory inventories of consumer products are about normal.

The rapid increase in sales of commercial and industrial electronic equipment and components is sure to continue, Parris believes. He anticipates dollar volume of tubes and parts to continue at about 1956 rates. The decline in components used in radio and tv receivers due to production cutbacks will be offset by greater demand for military and industrial equipment and for repair and maintenance of the increasing number of radio and tv receivers.

TAX cuts unlikely this year

Tax aid for the electronics industry, or any other industry for that matter, is very unlikely to pass Congress this year. Reason: the budget balancing situation is so precarious that Treasury Secretary Humphrey will oppose anything that costs the government revenue.

Drive for removing the 10-percent excise tax on uhf-equipped tv receivers and on color sets is given no chance at all, nor is there any likelihood that the present 10-percent tax rate on radio, tv and phonographs will be reduced to 5 percent, the current rate on household appliances.

Present 52-percent tax on corporate profits will be continued. But there's a remote chance that the present 30-percent rate of the first $25,000 of profit may be reduced to 20 percent, as an aid to small business. Many electronics firms could benefit.

Congress will consider the proposal to permit companies to write-off at regular rates the cost of used production equipment they buy, something the present law doesn't allow. This would help new electronics firms to get a start. Such firms often start out with used equipment.

Business partnerships, a business form common among small electronics firms, may get the benefit of legislation that has a good chance of passage this year. Technical revisions are being studied to iron out alleged inequities and hardships to partnerships written into the tax laws during the 1954 general overhaul.

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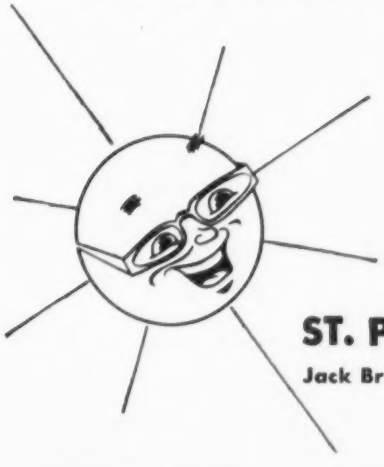

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THE MAN WE MEAN IS A COMPOSITE of the editorial staff of this magazine. For, obviously, no one individual could ever accomplish such a vast business news job. It's the result of many qualified men of diversified and specialized talents.

AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it" — "they" being all the industry's front line of innovators and improvers—and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you — giving a ready panorama of up-to-date tools, materials, equipment.

SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.

McGRAW-HILL PUBLICATIONS

EXECUTIVES in the news

RADARMAN Watson-Watt returns to Montreal

TERMINATING a two-year management contract between his Canadian consulting firm, Adalia Ltd., and California computermaker Logistics Research, Sir Robert Watson-Watt is going home to Montreal. In the two years that LR was run by Adalia, Sir Robert served as its president, directed research and development. LR's stability is another feather in the many-feathered cap of the man who arrived at the idea of radar in 1934 by what he calls "a triumph of pure reason."

Many people have linked Watson-Watt to the empire of Swedish industrialist Axel Wenner-Gren, who controls Logistics through his Panamanian holdings. Sir Robert prefers running his own show, doesn't want Adalia to become identified with "proprietary hardware."

Sir Robert, who was an advisor and consultant to the British armed services during the war, was born in Scotland. His forebears include James Watt, and a great-grandfather Watson who was burned in effigy for having introduced the first power looms into Scotland. No sportsman—"I've fought a thirty-years' war against exercise"—Sir Robert has a deep affection for music, and a flair for language, philology and semantics. He plays Scrabble, says he is consistently defeated by Lady Watson-Watt.

His interest in language almost lost him to science: "My headmaster wanted me to become the editor of the Glasgow Herald." He chose the sciences instead, and after a year at St. Andrew's University was appointed assistant to the professor of natural philosophy.

Strictly PERSONAL

Dear Sir:

In my opinion, the single electronic development that would do the most good for Remington Rand . . . (and) the country at large would be the development of cheap, reliable transistors, with all the various characteristics that are required for varied essential industrial and military needs.

(As regards) the general prosperity of the country . . . possibly

the development of completely satisfactory color tv, with public acceptance, would result in the maximum present benefit to the business community.

LESLIE R. GROVES
REMINGTON RAND
STAMFORD, CONN.

Dear Sir:

We are constantly extending our electronic controls to our machinery as well as extending the use of electronic equipment in our office operations.

There are so many fields of promise . . . we are watching all new developments as closely as possible to determine their application to our particular needs.

LUCIUS D. CLAY
CONTINENTAL CAN CO.
NEW YORK

Dear Sir:

Your action . . . is rather unusual insofar as bringing out 3 separate issues is concerned. Perhaps this will set a new standard for the industry. It appears to me . . . that any one issue of any one publishers' tries to encompass too many subjects, too many ideas, in the attempt to have overall appeal to many readers. . . . Your attempt at classifying the reader will be a noble try, and I hope you succeed.

NICK J. LAUB
NICK J. LAUB CO.
MINNEAPOLIS, MINN.

Dear Sir:

During the first six months of this year (1956), I worked with the Department of Commerce in preparing a report on the Electronic Test Instrument industry. . . . We found that total procurement levels for "general purpose" electronic test instruments were running at a rate of about $160 million annually in the first half of 1956. . . . We think it is reasonable . . . to assume that the levels of the industry as a whole will exceed an annual rate of $200 million in 1957.

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CEROC is an extremely thin and flexible *ceramic* insulation deposited on copper wire. *This ceramic base insulation is unaffected by extremely high temperatures.* Thus, in combination with silicone or Teflon overlays, Ceroc insulations permit much higher continuous operating temperatures than are possible with ordinary insulations.

There are three standard Ceroc Wires: Ceramic Single-Teflon and Ceramic Heavy-Teflon for operation at 250°C feature unique characteristics of flexibility, dielectric strength and resistance to moisture. They have been used successfully to 300°C in short time military applications. Ceramic Single-Silicone, for 200°C application, pairs the ceramic with a silicone reinforcement to facilitate winding.

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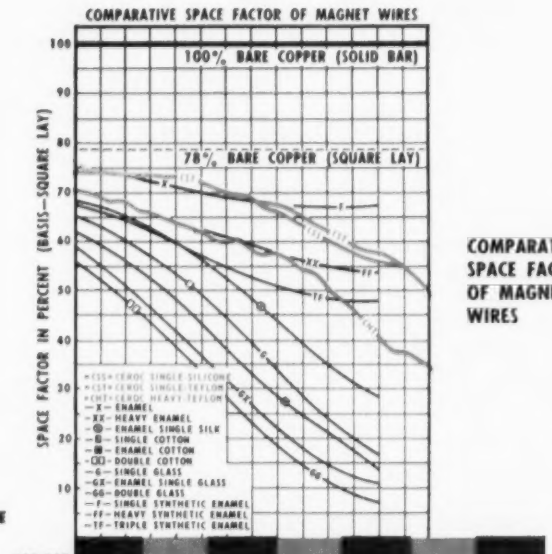
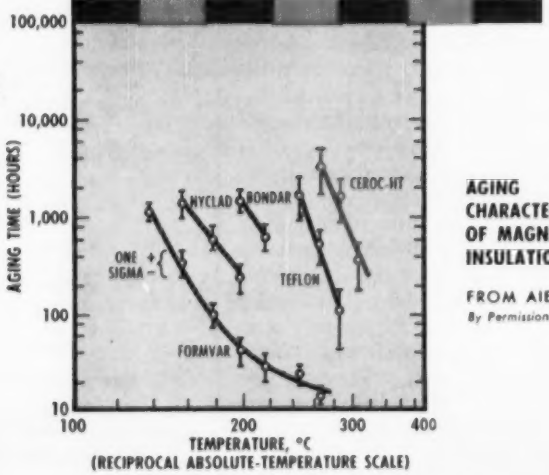
ENLARGED CROSS-SECTIONS OF CEROC® COPPER MAGNET WIRE

COMPARATIVE SPACE FACTOR OF MAGNET WIRES



COMPARATIVE SPACE FACTOR OF MAGNET WIRES



AGING CHARACTERISTICS OF MAGNET WIRE INSULATIONS

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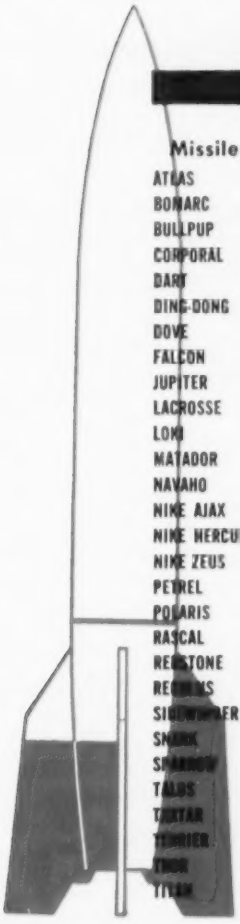
JANUARY 20, 1957



STATUS OF GUIDED-MISSILE PROJECTS

Missile	Mission	Service	Range in Miles	Guidance System	Status
ATLAS	Surface-To-Surface	Air Force	5,000	Radio-Inertial	Developmental
BOMARC	Surface-To-Air	Air Force	Long Range		Production
BULLPUP	Air-To-Surface	Navy			Developmental
CORPORAL	Surface-To-Surface	Army	50	Beam-Rider	Operational
DART	Surface-To-Surface	Army	Short Range	Wire	Production
DING-DONG	Air-To-Air	Air Force			Developmental
DOVE	Air-To-Surface	Navy			Production
FALCON	Air-To-Air	Air Force	5	Radar Homing	Production
JUPITER	Surface-To-Surface	Army	1,500		Developmental
LACROSSE	Surface-To-Surface	Army	Short Range	Command	Production
LOKI	Surface-To-Air	Army			Production
MATADOR	Surface-To-Surface	Air Force	600	Command	Operational
NAVAHO	Surface-To-Surface	Air Force	5,000	Celestial-Infrared	Developmental
NIKE AJAX	Surface-To-Air	Army	18	Command	Operational
NIKE HERCULES	Surface-To-Air	Army	About 40	Command	Developmental
NIKE ZEUS	Antimissile	Army			Research
PETREL	Air-To-Underwater	Navy			Operational
POLARIS	Surface-To-Surface	Navy	1,500		Developmental
RASCAL	Air-To-Surface	Air Force	Long Range		Developmental
REDSTONE	Surface-To-Surface	Army	200		Production
REGULUS	Surface-To-Surface	Navy		Command	Operational
SIDEWINDER	Air-To-Air	Navy		Infrared	Operational
SNARK	Surface-To-Surface	Air Force	5,000	Celestial	Developmental
SPARROW	Air-To-Air	Navy	3	Beam-Rider	Operational
TALOS	Surface-To-Air	Navy			Production
TARTAR	Surface-To-Air	Navy		Beam-Rider	Production
TERRIER	Surface-To-Air	Navy	20	Beam-Rider	Operational
THOR	Surface-To-Surface	Air Force	1,500	Radio-Inertial	Developmental
TITAN	Surface-To-Surface	Air Force	5,000	Radio-Inertial	Developmental

MISSILES top $1 billion

Nearly half of $2.6-billion missile contracts go for electronics

Missiles take 20-percent of military R & D

Electronic costs vary widely between systems of same type

MULTIBILLION DOLLAR guided-missile program makes up the electronics industry's most rapidly expanding market.

In three years, guided-missile expenditures have more than doubled. While output of aircraft, ships, vehicles and other military goods is being cut back or stabilized, the dollar volume of missile contract awards will be boosted at least 10 percent annually. Expenditures will climb 20 percent a year or more during the years ahead.

Electronics' share of the guided-missile dollar is hard to pin down. But rough Pentagon estimates are that from 35 to 50 percent of the missile budget goes for electronics.

• New contracts for missile procurement and pro-

duction will total $2.6 billion in 1957. For research and development the total will be $366 million.

• Of these sums, $1.1 billion is earmarked for electronic equipment—notably surveillance, acquisition, target tracking, control and guidance systems. This represents over one-third of the total military electronics market.

Actual expenditures for missile procurement and production in fiscal 1957 will come to $1.3 billion, slightly more than 10 percent of total military hardware.

This is a new record spending figure for missiles, and the rate is climbing fast. The Air Force, which accounts for well over half the military missile budget, tells the story best: Five years ago, missile expenditures made up only 0.1 percent of its production. Now, 8 percent of its deliveries of aerial weapons are missiles. By 1960, the proportion is likely to be 35 percent.

Says Major General David Baker, production director of the Air Materiel Command: "What is going on today (in guided missiles) is more of a revolution than an evolution."

Other indications of the booming missile future:

• The largest chunk of the military research and development program, over 20 percent, is devoted to guided missiles.

• The Pentagon has drafted a fiscal 1958 appropriation request for missiles well in excess of the $1.6 billion voted by Congress this year.

• Military experts say guided missiles will replace piloted aircraft in the near future in about half of strategic bombing missions and about one-third of tactical missions.

Electronics is the critical or so-called pacing element over and above costs in determining a missile system's reliability.

Electronics costs vary widely. The variation is frequently greater between two missile systems of the same type—say, Falcon and Sidewinder, both air-to-air missiles, than between two different types of systems such as air-to-air and surface-to-surface.

Electronic cost variations from these cases are illustrated by such examples as:

• For the Navy's new Sidewinder, only one-sixth the costs are electronic. The missile has an infrared guidance system, containing only 9 tubes. In another air-to-air missile, electronics make up $5,000 of the missile's total $13,000 cost. For a third-air-to-air missile, costing $24,500 each and being produced at the rate of 100 monthly, electronics apparatus costs $7,500.

• In one large surface-to-surface missile, electronics cost $30,000 out of a total cost of $160,000. In another, $13,000 out of $95,000.

These cost estimates do not include complex electronic fire-control radars installed in the aircraft, in the case of the air-to-air missiles and elaborate electronic ground support equipment for the surface-to-surface missile.

In the Nike Ajax surface-to-air missile the permanent electronics equipment for one ground installation costs $1 million—20 times the cost of one missile vehicle.

Cost of telemetering and testing facilities at missile proving grounds are not charged to individual missile projects and do not figure in estimating the costs of a production missile.

A cost variation exists in the production rate. As a missile gets into heavier volume production, manufacturing expenses are greatly reduced.

The Office of Defense Mobilization has granted about 50 fast tax write-off certificates on plant expansion costing about $200 million for facilities specifically identified with missile work. Of this sum, an average 65 percent was covered by accelerated amortization.

But ODM officials say this doesn't really tell the whole picture of missile-stimulated expansion, since other new facilities are interchangeable with missile operations.

Keeps BREW young

ULTRASONIC machine has replaced old-fashioned bottle-knockers at Ballantine's Brewery. Ultrasonic jolts before capping remove excess air from beer bottles, prolonging shelf life. Built by Mack Truck, device can handle 400 bottles a minute

Civil air SALES to double

Business flying boom increases instrument sales
Airlines outfit new planes, update electronic gear
CAA beefs up ground equipment and fosters new NAVAIDS

ELECTRONIC SALES dependent on civil aviation should rise sharply through 1960, then rise more moderately. The next four years should see $500 million in sales of equipment, spare parts and installation.

Major factors are business aircraft popularity, airline plane orders and CAA efforts to overcome multiplying traffic control problems.

Business aircraft, now over half the civil fleet of 60,500 planes, are the biggest market. Of 6,000 civilian planes made in 1956, 88 percent were four place or larger. The proportion is triple 1951, when 2,300 planes were made, the Aircraft Industry Association reports. Production exceeded CAA forecasts.

All sources expect business plane production to rise 20 to 25 percent a year. Decentralization of large firms, quickened tempo of business and increased confidence in safety of air travel foster the trend.

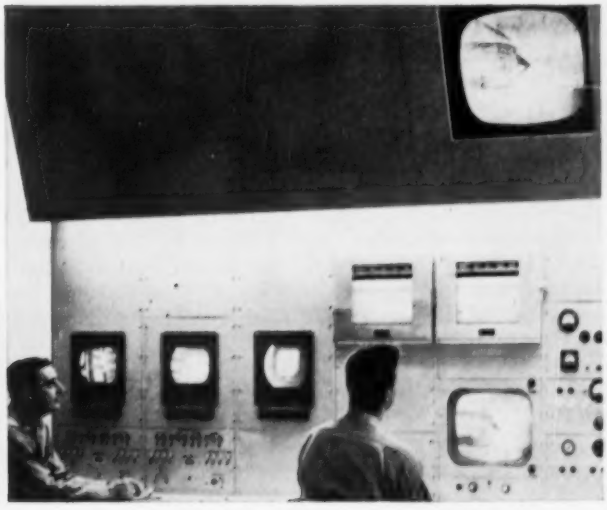
Business flyers bought $50 million of electronic equipment in 1956 and should take $100 million in 1960. Small planes take two-thirds now and will increase the ratio. Large planes carry airline-type electronic equipment but are only a tenth as numerous. Pleasure and farm flyers buy a scant $1 million of minimum equipment.

Airline purchases will probably go from $15 million in 1956 to over $20 million annually, then dip after 1960. Advance orders for big new types of planes are approaching 1,000, but this rate is not expected to continue.

The Air Transport Association estimates each airliner will carry $100,000 in electronics by 1958, including spares and installation. Cost in 1946 was $10,000 a plane and in 1954, $30,000.

One big "if" is air traffic control. If congestion increases flying dangers and delays, sales could sour.

TELEVISION speeds aircraft testing



INDUSTRIAL TELEVISION camera, (left) permits Lockheed engineers inside to observe pattern of air flowing over tufts attached to underside of plane. Right, personnel at Lewis Flight Propulsion Laboratory watch motor model in wind tunnel. Tv system ends dependence on periscopes, film or ports.

particularly business aircraft. The CAA is making efforts to overcome traffic problems.

The CAA is well into a $246-million program to improve ground equipment. Its aim is to position all aircraft above 15,000 feet in the 80,000 miles of federal airways. This will reduce the safety airspace required around planes and allow more in the air.

Over $80 million will be spent for radar, $45 million for Vortac stations and $120 million for other equipment, modernizing and coordinating. Installation is included, maintenance is not.

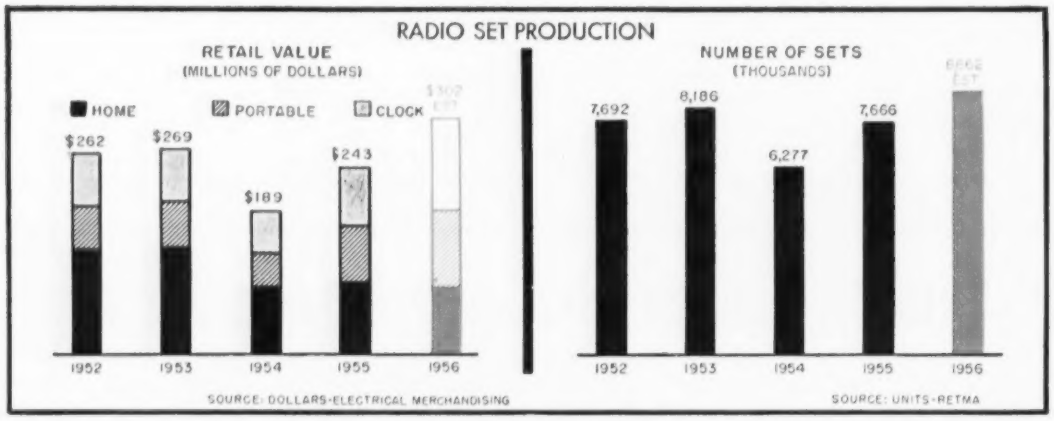
Completion of the $246-million program to improve ground equipment was to take five years, but the CAA now wants to finish in three years. The fiscal 1957 appropriation was upped to $75 million, leaving $171 million for the two years beginning July 1.

The CAA got only $105 million for navigation equipment in 1950-56, of $281 million requested. But the current plan should mature. Congress showed its awareness with the increased fiscal 1957 appropriation. Pressure from users is considerable.

Three new devices grew out of traffic control. The CAA's Vortac and positioning radar will require transponders in aircraft. The airlines are anxious to have a collision warning device.

Advanced government planning is underway. A Presidential advisory group is looking into the needs of the 1970's. No conclusions have been reached, but extension of the CAA system is indicated.

PRODUCTION and SALES statistics



Radio set production and sales moved well ahead of last year with the help of increasing clock and portable sales and despite declining home-radio sales (so-called by RETMA: including conventional console and table models). It is estimated that the value of all radio sets produced, except auto radios, will amount to more than $300 million in 1956 when final figures are tabulated.

Number of sets produced is also on the way up. The 7,666,000 sets produced in 1955 were a big improvement over the 1954 low of 6,277,000 sets. Based on production of 6,476,000 sets in the first nine months of 1956 it is estimated that 8,662,000 sets were manufactured last year.

Dealer sales moved in the same direction. RETMA reported 5,327,000 sets shipped to dealers during the first nine months compared with 4,197,000 in same period last year.

Hughes Aircraft says its 1956 semiconductor sales will run $12 million, roughly 20 percent of the estimated national market of $60,000,000. A $300 million semiconductor market by 1960 is predicted by Hughes semiconductor division.

American Electronics reports weather simulator production now moving into high gear as weather simulator division's monthly sales volume approaches $1 million. Company nine month sales totaled $5,947,000 compared with $4,318,000 for first nine months a year ago.

Packard-Bell reports tv sales of home products division moving up while rest of industry's sales fell off. Its tv sales between August 1955 and October 1956 were up 19 percent while industry sales for the same period were down 24 percent.

How to ATTRACT engineers

Firms seeking engineers offer varied benefits
But what do the engineers really want?
One way to find out is to ask them

ENGINEERS say they are influenced to take jobs that offer certain benefits. A survey of 2,596 engineers in 57 companies was made by the McGraw-Hill Classified Advertising division. Engineers were asked which of 43 benefits influenced them and which influenced them greatly.

Of 982 engineers in 18 electronic firms, 53 percent say challenging opportunity influenced them greatly in choosing their jobs. Potential company growth, high starting salary and a progressive research and development program were next in importance.

When the question is broadened to include those who are somewhat influenced by these appeals, the order changes. Starting salary influences 90 percent of the engineers in electronic firms, more than any other attraction.

Also high on the list of benefits somewhat influencing an engineer's choice are: the company's prestige and reputation, paid vacations and holidays, quick advancement and a tuition-refund program.

Benefits that do not appear on the graph but are a major factor for 15 to 17 percent of electronic engineers include association with leading men in the field, recreational facilities in the vicinity, executive or professional standing, health insurance, surgical insurance and retirement or pension plans.

Few engineers say they are attracted by annual physical exams, low-cost company lunchrooms, company recreation facilities, credit unions or discounts on company products.

With some exceptions, electronic engineers want the same things as other engineers. Engineers in electronic firms indicated seven percent more often than engineers as a whole that they were greatly influenced by laboratory, library and other facilities.

Progressive research and development programs, starting salaries and salary increases also appeal.

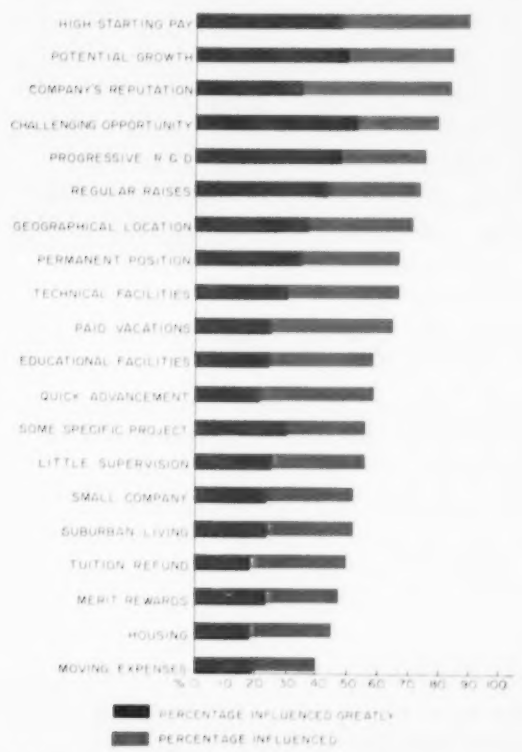
The engineering group as a whole said, 6 percent more often than the electronic engineers, that they were significantly influenced by potential company growth, the company's prestige and reputation and by good climate.

When the statistics are broken down according to whether an engineer is single, married with one dependent or married with two or more dependents, engineers with greater responsibilities are seen to be more conscious of economic security. For example, starting salary, periodic increases and a permanent position influence them more often than average.

An odd fact revealed by the survey is that the desire for insurance benefits among married men diminishes as the number of dependents increases.

Engineers with two or more dependents also tend to be less interested than those with one dependent in the company's prestige, the educational facilities in the area, work on a specific project and an opportunity to work with leading men in the field.

BENEFITS THAT INFLUENCE ELECTRONIC ENGINEERS



Frank P. Downey, Vice-President, American Machine & Foundry Co., says:

"He sets up 6,324,500 games a week!"

"The pin boy has been replaced in over 20,000 bowling alleys by our 'Mr. Pinspotter.'

"He's the symbol for AMF's completely automatic unit that sets the pins up and returns the ball in a matter of seconds!

"In many places 'Mr. Pinspotter' works 24 hours a day!

"He's *always* on the job for one good reason—Air Express!

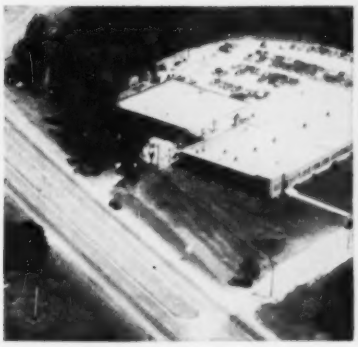
"When an AMF automatic pinspotter needs spare or replacement parts, they leave our Shelby, Ohio, factory for every state in the country—even Hawaii and Alaska—by Air Express. Radio-controlled trucks cut pick-up time, often in half. Air Express private teletype 'keeps an eye' on the shipment.

"Yet, with all this speed and service, AMF actually saves money with Air Express. A typical 15-pound shipment goes from Shelby, Ohio, to Philadelphia for $3.71. That's $3.94 less than any other complete air service!"

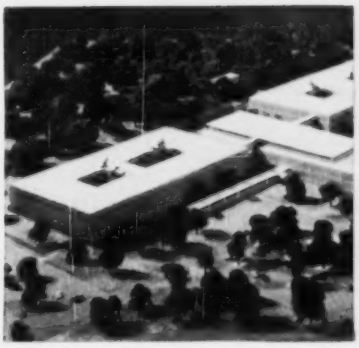
Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*

CALL AIR EXPRESS . . . *division of* **RAILWAY EXPRESS AGENCY**



ACCESS to superhighways . . .



PLEASANT surroundings . . .

AMPLE parking illustrate . . .

What to look for in a SITE

Key factors: skilled labor supply, transportation facilities
And don't forget wage level, tax situation, union policies
Many firms like placing new plants near research centers

THERE'S MORE to picking a site for an electronics plant than pointing a finger. In fact, a hatful of knowledge is required.

Executives consider more than a dozen factors when looking for a new place to build.

A few of the more important factors are: an adequate supply of labor skilled in electronics assembly, proximity to customers, accessibility of materials and supplies and a competitive level of wages in the area.

Also important are: a favorable local tax situation, adequate transportation facilities, availability of research and engineering and market services.

Other factors to be considered are: utilities, climate, strength and policies of labor organizations and extent of the existing electronics industry.

When seeking a site, manufacturers have found it a good idea to make a check list, then grade each factor in each community under consideration.

How big should a plant site be? Harold C. Booth, executive vice president of Bomac Laboratories in North Beverly, Mass., says:

"You need a parking area at least three times larger than your building area."

Automobiles have revolutionized site-selecting concepts. Just about everyone has a car. Employees want a place to park where they work. Availability of parking often influences choice of an employer.

Other "little" things that have proved important to manufacturers are: nearness of recreation, shopping, churches, schools and libraries.

Recently the Greater Boston Chamber of Commerce made a country-wide survey on site location factors for the electronics industry.

Forty-seven percent of the companies answering indicated they were planning new or additional plant locations.

As for the firms' primary consideration, supply of skilled labor topped the list. And in nearby North Andover, Mass., fast-expanding Western Electric proves the point.

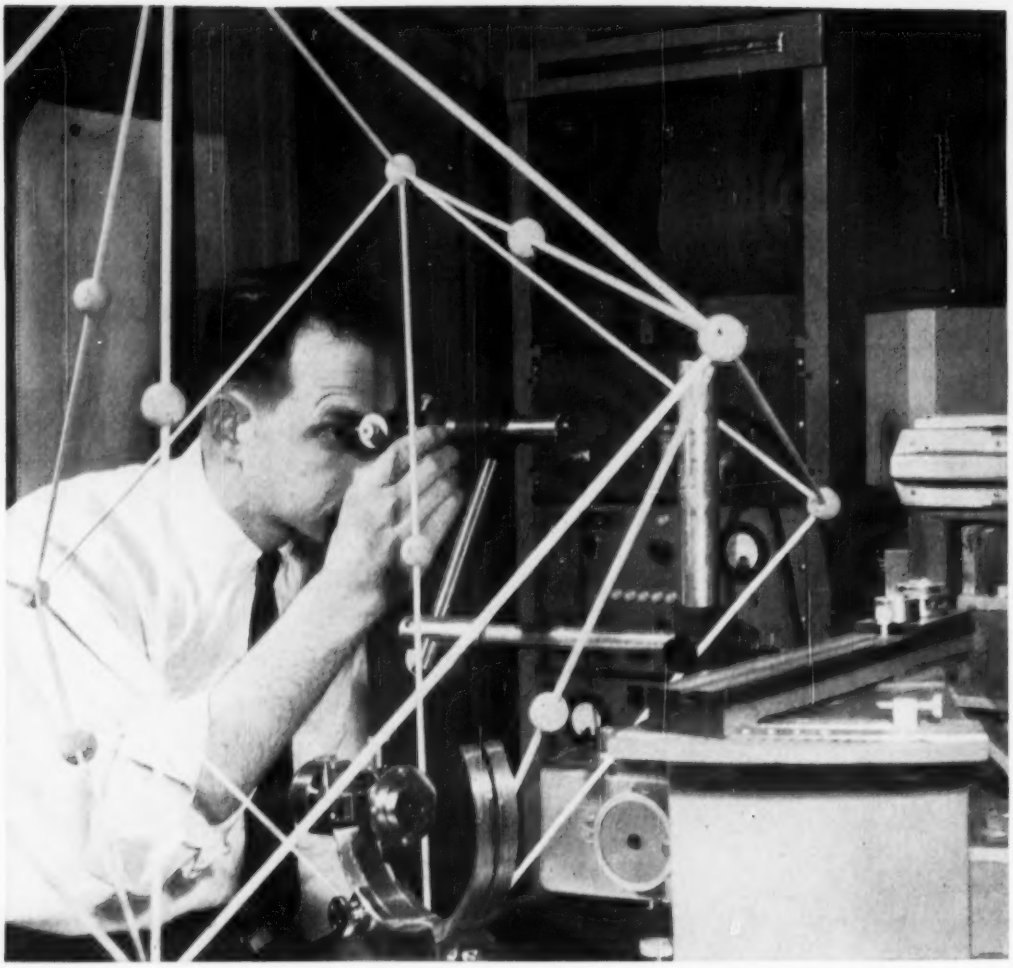
This company is mushrooming because of good productive manpower. Its facilities are being expanded to 1,250,000 square feet.

The Bay State, which has more than 450 firms in electronics, has other case-proving examples.

Proximity of research centers and educational institutions constitutes a prime reason why Avco plans to build a $15-million Research and Advanced Development Division center in Wilmington, Mass. A few minutes away are Cambridge's famed "research row," Harvard and MIT.

For electronics firms, it's more important to be near brains than raw materials.

The new Avco location will be a good example of a secluded site within the Boston metropolitan area.



BASIC crystallography, as carried on at IBM, is essential in solid-state electronics, but . . .

How much BASIC research?

There are no copybook maxims telling what to spend
Some top research managers have rough yardsticks
The final answer is judgment, not rules

ELECTRONICS, nurtured by the research of past decades, depends more on research for its continued growth. How much of this research should be of a fundamental nature—pertaining to materials and phenomena—is a question of concern to management. There are no firm rules but a top-notch research director can usually tell.

William O. Baker, vice president in charge of research at Bell Telephone Laboratories, says his company has no statistical rules. Bell Labs spends more than a fifth of its annual Bell System budget of about $70 million on basic research, much of which is also applicable to military research and development programs.

According to Dr. Baker, the amount of money spent on basic research is a matter of management judgment. But he adds, "If we don't find our fundamental research program advancing something practical or if advancement towards practicality is not being aided by fundamental research after four or five years, we're on the wrong track."

The key to basic research says Baker, lies in the use of systems research and engineering. This means an integrated study of the business from basic research to actual operating systems.

"The whole future of business machines," says IBM's Director of Research Emanuel R. Piore, "depends on what is in the physical universe that will provide new components—what phenomena in physics, new knowledge or technique may have practical application."

Commenting on how IBM measures its research results for a five-year interval, Dr. Piore said, "We look at the machines we have and we decide what impact has our research program had on each machine? Have we gotten the most from our research?"

GE feels that basic research work of colleges and universities must be supplemented by effort in industrial laboratories. "The interest of scientists at university laboratories does not coincide by any means with the technical fields that are important to industry," says C. Guy Suits, a vice president and director of research.

GE has built 12 new laboratories and spent $75 million in fundamental and applied research facilities since the second world war. The company now has 42 full-scale laboratories.

RCA's senior executive vice president, Elmer W. Engstrom, says expansion of basic research in his company is indicated in the same proportion to overall research that holds at present.

"Management feels it ought to go along with a one-third effort in basic research," says RCA's Dr. Engstrom. "Business is moving into an area where research is being used up and, of the great growth in university research programs, only a small part is of a fundamental nature."

DEFENSE research dips

IN RESEARCH and development, the military services will award $210-million worth of contracts for electronics projects this year, compared to $220-million in 1956. The sum is expected to drop to about $185-million in 1958.

But these funds are for what the Pentagon calls "direct intention electronics"—that is, ground-based radar, communications and other equipment not tied to missiles and planes. When electronics research and development included in missiles and aircraft projects is added, the total is likely to be doubled. Research and development spending for defense is being maintained at a stable level of expenditures.

Electronics is taking on a bigger role in procurement of military production equipment and facilities, now running over $375-million annually. The trend is electronic numerical control on machine tools for aircraft production.

TECHNICAL digest

An instrument developed in England to measure oxygen content of human blood may reduce the need for taking blood samples by the finger-puncturing method. Two different wavelengths of light, transmitted through the patient's ear lobe to approximately filtered photo cells, are compared. The difference in light absorption provides a direct indication of the percentage of oxygen in the blood, often making it unnecessary to count red blood cells.

Metals which become superconductors when cooled to near absolute zero regain their normal resistance in the presence of a magnetic field. This is the principle of the cryotron, essentially a one-inch length of wire wrapped in a single-layer winding. The cryotron can perform flip-flop and switching functions in computers. The control winding furnishes the magnetic field which changes the wire from a superconductor to its normal state.

Slow-scan tv signals may be sent over conventional telephone wires by a converter which changes fast-scan signals to slow-scan signals requiring only 1/800 the bandwidth. The system is expected to have applications in industrial tv systems where an additional monitor is needed at considerable distance from the system and where high resolution is not essential.

Burn-in, or the tendency of television image orthicon camera tubes to retain a previous picture, is said to be reduced as much as 90 percent at WBAL-TV in Baltimore. The expensive camera tubes need be discarded about 25 percent less frequently when the lens board is oscillated at a slow rate while shooting scenes. The lens-board motion is compensated for electrically.

COMPUTERS go to sea

To launch interfleet missiles a skipper must know where he is
Inertial navigation can tell him with extreme precision
New Navy techniques mean more business for electronics firms

EXPERIMENTAL forerunner of a fleet of ballistic-missile launching vessels, the *USS Compass Island* engaged in practical testing and evaluation operations this month. The converted Mariner-class cargo ship carries the most elaborate navigation equipment ever to go to sea. Every basic element of the $4-million system contains electronics.

The Compass Island's primary mission is to speed up evaluation of the Ship's Inertial Navigational System (SINS) for precise midocean navigation to expedite launching of the top-priority fleet ballistic missile.

Reason for the equipment's high cost is development. All equipment aboard, except for two $45,000 Bendix all-purpose computers, is still experimental. New equipment will be added continually for testing and evaluation before approving it for tactical ships. $100,000 a year will be spent for component replacements.

Sperry, whose Marine Instruments Division developed SINS with the Navy's Bureau of Ships, sees good business in the equipment as continuous development work.

"Military business for SINS type equipment will be substantial," says Captain L. L. Schock, head of the Ship Navigation Branch, Special Projects Office, Bureau of Ordnance.

AUTOMATIC celestial navigation checks Ship's Inertial Navigational System

Capt. Schock sees no commercial use for SINS at present. "The system," he says, "is unnecessarily precise for commercial use and unduly expensive."

SINS, in Schock's opinion, will never be installed in general-purpose naval vessels. He does not foresee it in destroyers within the next ten years. High cost will limit it to missile-launching submarines, ships and carriers where extremely precise position information must be known for mission success.

Regarding aircraft, Sperry's Gordon Watt says, "The basic principles may be used but SINS itself will never be cut down to size and installed in an airplane." Although Sperry's work in SINS is all government, there will undoubtedly be techniques and principles applicable for civilian use, Mr. Watt adds.

To check and correct the SINS, the ship will take to sea a celestial tracker produced by Sperry. The photoelectric telescope sits on a stabilized platform which was developed by the Material Laboratory of New York Naval Shipyard.

Navy's Bureau of Ships and GE developed a sonar device to measure the ship's ground speed. Control Instrument division of Burroughs produced an underwater electronic device to determine and indicate the ship's speed through the water.

Woods Hole Institute developed the Geomagnetic Electrokinetograph which measures speed of the ocean current transverse to the direction of the ship. Lamont Institute produced an electronic device that determines speed over the ground. Kearfott supplied gyros and accelerometers. Naval Ordnance Laboratory developed an acoustic correlation system for observing the ocean bottom.

Ferrand Optical Co. is developing an optical tracker as well as a horizon follower—a fine-line tv telescope for looking at the horizon in several directions at once. Electronics Corp. of America is working on a telescope with improved infrared detectors.

Collins Radio is developing a radiometric sextant which will line up radio transmissions coming from the sun or moon as an optical telescope lines up light. Detroit Controls is producing a radiometric sextant for use with radio stars. Reeves is developing a complete star tracker.

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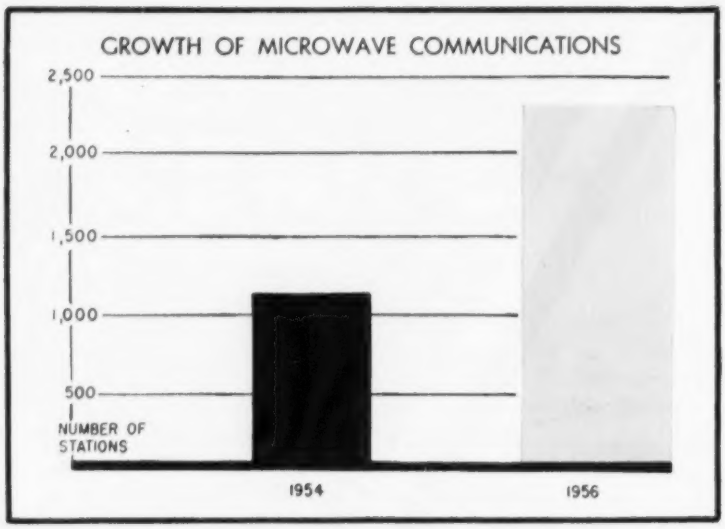

2,414 MICROWAVE stations

Links nearly double in four years
FCC plans allocation program
Scatter systems on the way

"It's BUSTING OUT all over." This is a commentary on microwave radio facilities. Speaking is Albert L. McIntosh, FCC Frequency Allocations chief.

McIntosh traces the growth of microwave communications back to World War II.

In the past four years, each year has seen the expansion of facilities jump almost 35 percent. Nothing in sight indicates a slowdown.

Power utilities, railroads, forest conservation services, fire services, highway departments, industrial users and common carriers all are building.

At the end of 1954, 1,367 microwave stations were in operation. The close of 1956 saw the number swell to 2,414.

Microwave systems transmit teletypewriter, telemetering, telegraph, facsimile and voice signals. Also monochrome and color tv and radar data.

Petroleum and natural-gas pipeline companies have more than $50-million worth of equipment in operation.

The Operational Fixed Microwave Council believes that the oil and gas industry is just on the edge of its greatest microwave expansion. Since 1954 the number of gas and oil pipeline systems have grown from 26 to 53, the number of stations from 316 to 785.

Common carriers now have around 848 stations operating. AT&T expects to spend $210-million during 1957 in building microwave facilities.

The FCC is launching a reexamination of microwave allocations. Many microwave communications systems are operating on an experimental basis. Some point-to-point microwave service has shared frequencies with industrial and medical devices such as industrial heaters and diathermy.

Want more information? Use post card on last page.

TRANSISTORS enter transmitter field

TRANSISTORS are being used on a limited scale in radio transmitters. Motorola has for a year been producing transistorized two-way radios. It expects the majority of its mobile microphones in 1957 to use transistors. But a sampling of equipment manufacturers indicates that any large breakthrough of the transistor in this field is at least a year away.

Philco says: "Tube performance can be achieved by transistors up to 40 megacycles. The next year will see the range increased at least to 60-70 megacycles."

Avco intends to begin producing in March a cigar-box size transmitter-receiver for civilian use. Price for pilot models: around $700. Company expects to bring this down to $560-580.

Collins Radio in six months sold 150 transistorized four-channel remote amplifiers at $500 apiece.

The American Broadcasting Co. used Collins equipment when it installed new studios in the Metropolitan Opera house. Formerly amplifiers containing more than 200 tubes were used. The new equipment contains four tubes and 30 transistors.

CLOSED TV firms bullish

MANUFACTURERS and promoters agree a sharp rise is imminent in closed-circuit tv volume. General Precision Laboratories says it will be $25 million by the end of 1960.

Estimates of today's market range to $6 million a year, with the number of installations something over 2,000. Single-camera, single-monitor systems can be bought for $2,500. Studio types go up to $60,000.

Irvin P. Sulds, president of Telecom Systems, Inc., estimates 500,000 installations by 1960.

Acceptance is greatest in industry. Many installations are tailor-made. Volume production should lessen costs and add to sales.

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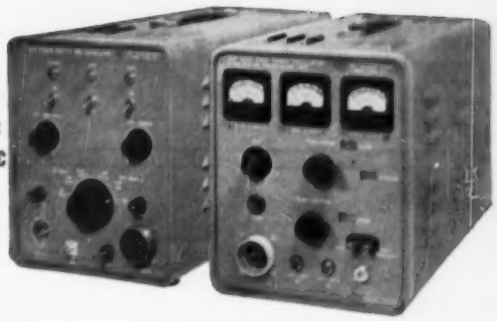

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Frequencies: 240 to 1000 cycles
Accuracies:—
Type 50 (±.02% at —65° to 85°C)
Type R50 (±.002% at 15° to 35°C)
Double triode and 5 pigtail parts required
Input, Tube heater voltage and B voltage
Output, approx. 5V into 200,000 ohms

FREQUENCY STANDARD
TYPE 50L

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Weight, 2 lbs.

Frequencies: 50, 60, 75 or 100 cycles
Accuracies:—
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Type R50L (±.002% at 15° to 35°C)
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Input, 150 to 300V, B (6V at .6 amps.)

*3½" high
400 to 500 cy.
optional

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Accuracies:—
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Type R2003 (±.002% at 15° to 35°C)
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Input, 115V. (50 to 400 cycles)

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Frequencies: 240 to 1000 cycles
Accuracies:—Same as 2003, above
Type 2007S—Silicon type
Input, 28V.
Output, Multitap, 75 to 100,000 ohms
*3½" in 2007S, 400 to 800 cycles.

FREQUENCY STANDARD
TYPE 2121A

Size
8¾" x 19" panel
Weight, 25 lbs.

Output: 115V
60 cycles, 10 Watt
Accuracy:
±.001% from 20° to 30°C
Input, 115V (50 to 400 cycles)

FREQUENCY STANDARD
TYPE 2001-2

Size 3¾" x 4½" x 6" H., Wght. 26 oz.

Frequencies: 200 to 3000 cycles
Accuracy: ±.001% at 20° to 30°C
Output: 5V. at 250,000 ohms
Input: Heater voltage, 6.3 - 12 - 28
B voltage, 100 to 300 V., at 5 to 10 ma.

FREQUENCY STANDARD
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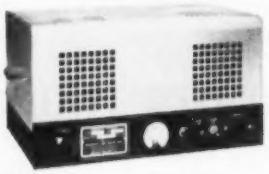
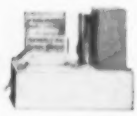


Size, with cover
10" x 17" x 9" H.
Panel model
10" x 19" x 8¾" H.
Weight, 25 lbs.

Frequencies: 50 to 1000 cycles
Accuracy: (±.002% at 15° to 35°C)
Output: 115V, 75W. Input: 115V, 50 to 75 cycles.



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Planes spawn $30-million business
Corporate owners contribute most
Service income to double by 1962

CORPORATION-OWNED aircraft numbering 18,000 carry more than $800 million in electronic equipment. Maintaining this equipment is a $30-million business. Privately owned planes, numbering 44,000, usually carry less equipment per plane but help bring electronic maintenance of noncommercial, civilian planes to the level of a big business.

Several firms are finding maintaining electronic equipment for the growing fleet of private and business planes a profitable enterprise. Smith-Meeker Engineering Co.'s aviation division began operations ten years ago with one car rigged up with radio test equipment. Today, with service stations at Teterboro Airport, N. J., and Westchester County Airport, N. Y., it does $¼-million business a year in maintenance, redesign, equipment sales and installation. Business has doubled during the last five years and is expected to double again by 1962.

With a capital investment of $80,000, field maintenance personnel currently number fifteen. The central office in New York sends out engineers when the field staff requires them.

Smith-Meeker has 250 regular customers owning 1,000 planes. Several corporations pay a flat rate of $3 per flying hour for each aircraft.

Other customers pay for work on an hourly basis. Fees for ordinary repair run about $5 an hour. Laboratory testing and redesign cost up to $6.25 an hour.

An average client pays from $1,500 to $2,000 a year per plane for maintenance alone.

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NICKEL supply to rise 50%

Four-year Canadian project planned
Prices double since 1950
Defense use seen increasing

EMBARKING on a four-year $175-million project, International Nickel announces it will lift its Canadian production 50 percent.

Meanwhile, nickel went up 9.5 cents a pound in December to 74 cents, almost double the 1950 price of 40 cents. Inco declined to speculate whether the expansion would drop prices.

Nickel is widely used in electronics. About 15 million pounds a year go into high temperature and electrical alloys, another 1.5 million pounds into magnetic alloys. Total U. S. consumption hovers around 200 million pounds a year.

Under expansion plans of Inco and other producers, free-world production may rise to 625 million pounds yearly in 1960, forecasts Henry S. Wingate, president of Inco of Canada. Production was 427 million pounds in 1955.

The 1960 output would exceed present civilian industry use by some 325 million pounds. The increase, Wingate said, would fill unsatisfied civilian needs while meeting rising defense requirements.

Inco plans to lift its regular nickel production from 255 million pounds in 1955 to 385 million in 1960. Of this, 24 million pounds will replace special government production, giving a net increase of 106 million pounds a year.

MERCURY price stabilizes

MOMENTARILY AT LEAST the price of mercury will remain firm. Price of the silvery-grey liquid metal is largely controlled by Spain and Italy and tends to keep in step with international tensions. Currently, a 76-pound flask commands $257 on the New York market.

Mercury is a good electrical conductor. Electrical and electronic uses accounted for 8,951 of the 57,300 flasks used in the U. S. in 1955. Mercury is used in switches, sealed relays and rectifiers, as well as lamps, batteries and other apparatus.

U. S. mines supply only a fraction of domestic needs and there is little hope of large increases in production. New deposits of cinnabar, mercury ore, are not being found in the large lodes that make for inexpensive mining.

California mines, which provide about one-half the U. S. supply, date back to the Gold Rush and are becoming exhausted. Mines have recently been reopened in Idaho and Alaska. But there is insufficient risk capital available for large-scale exploration and development.

The U. S. government has a standing offer to buy all North American production at $225 a flask. Would-be producers feel, however, that a floor price of $325 is needed to make mercury mining attractive to capital. Production costs are double those of World War II—when the government pegged the price of the strategic metal at $191.

Mining firms hesitate to speculate on the effect of increased production on the market price. It is said in the trade that Spain and Italy operate an informal cartel to adjust prices to forestall competition. Mercury is easy to store, hence its market easy to control.

Prices have fluctuated widely despite an increase in world supply from 143,000 flasks in 1950 to 175,000 in 1955. The market dipped to $74.81 in 1950 and rose to $291.44 in 1955. U. S. production, 51,929 flasks in 1943, dropped to 4,535 flasks in 1950 and was up 18,830 flasks in 1955.

Imports were 56,080 flasks in 1950 and 19,435 flasks in 1955. Italy produced 52,000 flasks in 1955 and Spain, 43,000.

MICA needs promote substitutes

WORLD'S LARGEST consumer of muscovite mica, the U. S. used an estimated 13 million pounds in 1955. More than 9 million pounds were imported, twice as much as during 1954. According to the National Association of Electrical Manufacturers, sales of mica by a group of eight major fabricators were $11,040,000 in the first 10 months of 1956, an increase of 5 percent over the same period in 1955.

The electronic industry uses about 65 percent of the muscovite mica consumed in the country, taking almost all of the top grade mineral. Capacitor and vacuum-tube manufacturers have bid the price of high-grade sheet mica to more than $10 a pound.

Look for an increasing use of mica substitutes. The increased production of tv, industrial and military electronic equipment, the limited world supply and the high labor costs involved in separating mica into sheets have stimulated the development of substitutes.

The electrical and mechanical properties of natural mica which make it so well suited for use as an insulating material and capacitor dielectric have kept it in use since the early days of radio communications. However, some characteristics of recently developed substitutes are claimed to excel natural mica.

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carries more cargo than any other airline in the world

ICBM nears completion

Air Force readies training site
$¼-billion research pays off
Two guidance systems planned

HINT THAT completion of the Air Force's security-shrouded crash program for developing an operational intercontinental ballistic missile is within sight was contained in an announcement by Major General B. A. Schriever, of the Western Development division of ARDC and director of USAF's ballistic missile program.

General Schriever outlined plans for converting a major portion of 86,000-acre Camp Cooke 169 miles north of Los Angeles into an Air Force base for training ballistic missile crews.

Overall bill for ballistic missile research in 1956 was better than a quarter-billion dollars. This figure accounts for no hardware. Now that the actual production stage has arrived, hardware costs are snowballing. Excluding research and development, the price tag on one ICBM has been estimated at $1 million. And it's anybody's guess how many of these Uncle Sam intends to produce.

Airframe manufacturers Convair, San Diego, and Martin, Denver are handling the 5,000-mile missiles Atlas and Titan, respectively. Douglas has intermediate-range Thor.

To guidance-system contractors the ICBM-IRBM program means big business. Major contractors include GE, Bell Labs, Arma and A. C. Spark Plug. Burroughs, at Paoli, Pa., and the Remington Rand Univac division at St. Paul are handling the computer work.

Hundreds of companies have subcontracted to furnish components and subassemblies. At present, 50,000 people, many on overtime status, are engaged in the ICBM-IRBM effort.

WDD has revealed that both inertial guidance and radio-inertial guidance have been developed under the program. Either or both may be used in directing Atlas, Titan and Thor to their targets.

WDD reveals that a successful operational weapon is within the known state of the art, that no major scientific breakthroughs remain. Nose-cone contractors, GE, Avco and Lockheed, apparently have hit upon workable methods for preventing the warhead from becoming a flaming meteor as it streaks down into the dense air surrounding the Earth. Problems of propulsion and auxiliary power assigned to Rocketdyne, Aerojet-General and AMF, reportedly are well under control.

The original Atlas, as envisioned in 1952, was to contain seven rocket engines, carry a 5,000-lb warhead and weigh one-half million pounds. The production model of Atlas will be considerably smaller, in the neighborhood of 100 feet.

Ramo Wooldridge is acting as technical director for the ICBM-IRBM program in concert with WDD. The third member of the R&D combine is the Ballistic Missiles office of AMC.

MILITARY Electronics

Radar guidance equipment designed and built by Reeves Instrument Corp. for the Terrier missile system installed aboard the USS Gyatt, the Navy's first guided missile destroyer, combines gunfire control system with radar guidance equipment.

If the approaching aircraft is identified as enemy, the radar tracks it and relays information to the missile launching computer for firing. A data system between launcher and missile shoots the missile into the radar beam by which it is guided to intercept the target.

RACE Rapid Automatic Checkout Equipment, produced by Sperry Gyroscope, brings automation to the tactical launching site to test, troubleshoot and service missile systems. A master console employs computer elements to check out all units of the missile system, provide maintenance and supply information for command decision.

Rocket flight simulator by Magnavox automatically subjects acceleration-sensitive devices to the entire range of acceleration and deceleration forces encountered during rocket flights. System can duplicate any two-stage flight. Nontechnical personnel can operate the simulator.

CONTRACTS awarded

Webcor's Government Division has signed a $2,700,000 order with the Navy Bureau of Aeronautics for airborne radar systems.

General Electric will manufacture radar systems amounting to $16,578,472 for Air Materiel Command.

Sperry Gyroscope received a $1,293,940 contract, calling for new, large-scale production of electronic engine analyzers for use at Air Force bases around the world.

The order provides for volume production of ground portable systems, incorporating five-inch oscilloscopes.

Army Signal Supply Agency, Philadelphia, has awarded 11 contracts

for research and investigation: $58,842 to RCA on low-noise microwave amplifiers and wave generators; $33,664 to U. S. Electric Manufacturing, New York, for design and development of a wafer-type battery; $39,932 to Radiation Research, West Palm Beach, Fla., on radioactive energy for portable batteries; $180,000 to the University of Michigan for additional research investigations directed toward rocket-borne measurements of temperature and winds in the Arctic; $65,288 to Armour Research Foundation of Illinois Institute of Technology, on Air Traffic Control Systems; $80,179 to General Ceramics, Keasbey, N. J., on improved types of high-frequency core materials by synthesis of ferrites; $79,587 to Stanford Research Institute, on advanced phases of design parameters for ground based antennas; $58,936 to Raytheon for additional research investigations on electron tube type QK-362; $70,829 to RCA on water activated batteries employing organic depolarizers; $44,446 to Motorola for research investigation on field test evaluation and redesign of radar set AN/PPN-13; $44,993 to Markite, New York, for research investigations on the use of conductive plastics in batteries.

Air Force Cambridge Research Center has two contracts for research: $50,000 for studies in radar cross sections of aircraft and missiles with the University of Michigan, and $125,000 for general studies in high-power beam tubes with Stanford University.

Hoffman Laboratories has been awarded a $22-million contract by the Navy for 6,001 units of the airborne portion of TACAN, an air navigation system designed to give pilot exact distance and direction information when landing under poor weather conditions.

Rome Air Force Depot placed a $2,051,654 order with Craig Systems, Danvers, Mass. for three air traffic control centrals AN/MRN-12, eleven receiving sets and radios AN/MRR-5 and twenty-four radio teletypewriters-facsimiles AN/MSQ-10.

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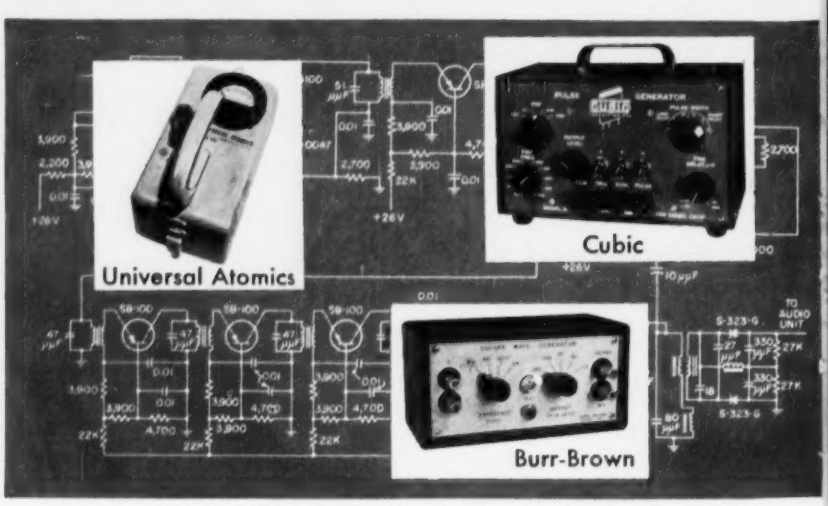
Transistors dominate



TRANSISTORS aid designers of test equipment, remote-positioning systems,

TRANSISTOR CHARACTERISTICS, such as low power consumption, light weight and ruggedness, are causing them to be used in a rapidly increasing number of electronic devices. Portable instruments manufactured by **Universal Atomics** (P1), **Burr-Brown** (P2) and **Cubic** (P3) are completely transistorized. A servo amplifier designed by **M. Ten Bosch** (P4) to operate on 60-cycle power is intended to meet the requirements of military specification MIL-E-5400.

Kay Electric (P5) broadband video amplifier is made with a built-in feedback circuit for stabilized gain and can be used as a preamplifier for oscilloscopes and vtvm's or as an audio amplifier. Shift registers announced by **Navigation Computer** (P6) feature pushbutton programming, information indication and number-of-bits selection.

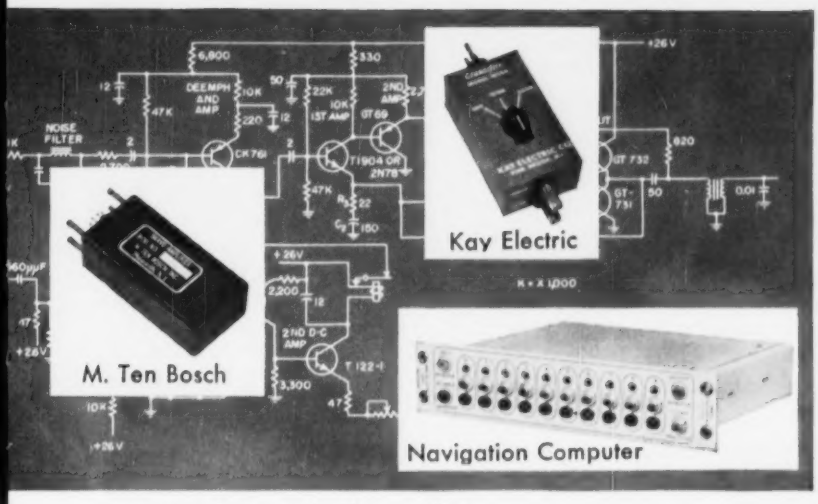
A 3-ounce accelerometer announced by **Humphrey** (P7) for use in instrumentation and control systems operates within a temperature range of -50 to 100 C and withstands vibration from zero to 2,000 cps up to 10 g. . . . Designed by **Daytronic** (P8) a differential-transformer amplifier provides a demodulated output signal for oscilloscopes, null-balance recorders and vtvm's. . . . **Entron's** (P9) vhf band-rejection filter with separate tunable high-Q rejection sections is expected to be helpful in removing interference.

A **Levinthal** (P10) power supply has been developed for klystrons with bombarded cathodes and is said to be completely protected by interlocks. . . . The type 6CQ8 medium-mu triode and sharp-cutoff tetrode announced by **RCA** (P11) can be used as a combined oscillator and mixer for black-and-white or color tv receivers.

Lindaner (P12) has high-pressure sealing devices called Hexseals, to prevent the entry of dust, moisture or other contaminants into standard toggle, rotary or pushbutton switches. . . . **Farmer Electric** (P13) has developed a synchronous contactor for such switching appli-

For more information circle numbers in SECTION B, READER SERVICE CARD (facing p 48)

NEW PRODUCTS



computing devices and video amplifiers

cations as punch-press control, magnetic counter actuation and register control. . . . A wireless microphone system designed by **Tru-Sonic** (P14) is actually a miniature f-m transmitter.

Richardson-Allen (P15) is marketing a silicon rectifier with a d-c output of 10 to 65 volts at 400 to 2,000 amperes for plating applications. . . . Extremely high deflection sensitivity is claimed by **RCA** (P16) for their 3WP1, 3WP2 and 3WP11 electrostatic-deflection cathode-ray oscilloscope tubes.

Weston (P17) announces the addition of two models to their line of metal-film resistors, which are said to withstand abrasion, thermal shock and temporary overloads without change. . . . Called Cirprint, a copper-clad laminated plastic by **Formica** (P18) offers high-insulation resistance, better cold-punching qualities and lower moisture absorbtion. . . . **Aerovox** (P19) is releasing a series of switches with small mounting dimensions.

A line of germanium rectifiers announced by **GE** (P20) has been designed specifically for use in mass-produced tv sets. . . . **Airborne Accessories'** (P21) line of miniature r-f filters and motor-start capacitors are claimed to meet the requirements of JAN-C-25, MIL-I-61-81-B and MIL-M-8609. . . . A 400-cycle motor gearhead released by **Servo-mechanisms** (P22) for application in servo control systems has a built-in slip clutch for protection of gearing and loads.

A load isolator developed by **Cascade** (P23) for operation in the frequency range between 12,400 and 18,000 mc is said to have a vswr of less than 1.1. . . . **Alden Products** (P24) announces a kit of components for plug-in construction of electronic equipment which is designed to cut engineering time required for packaging.

Leeds and Northrup's (P25) electronically controlled reactor simulator for training nuclear engineers incorporates an analog computer, control console and a model reactor core. . . . Production of antenna terminal insulators, contact strips and knobs is said to be faster with **Stokes** (P26) semiautomatic transfer molding press. . . . **National Instruments** (P27) sonic gas analyzer uses the change in velocity of sound waves passed through the gas to determine its composition.

Connectors molded from **Dow Corning's** (P28) glass-filled silicon, molding compound are claimed to

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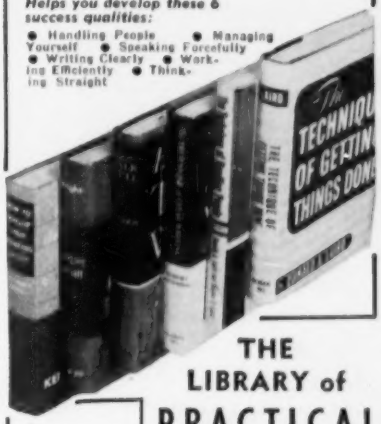

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provide better insulation resistance, particularly at high temperatures. . . . The time required for induction heating of specific areas of metal parts is said to be greatly reduced with a 10-kw machine developed by **Radio Frequency** (P29).

A device has been developed by **Waters** (P30) to permit flush or recessed mounting of the slotted shafts of potentiometers, trimmers or tuned coils to avoid accidental misadjustment. . . . **Smooth-On** (P31) has a hardener available for epoxy resins used for potting and encapsulation of electronic components which is claimed to give epoxies a heat-distortion temperature of 400 F.

Webber Engineering's (P32) low-temperature cabinet for testing electronic apparatus is claimed to reduce surrounding temperature to -100 F in 30 minutes. . . . Operation of high-speed direct-coupled circuits that require an ungrounded power supply should be possible with the Model A105-15 Isoply made by **Elcor** (P33).

Excellent overload characteristics are claimed for **Hammer Electronics,** (P34) combination pulse amplifier and single-channel analyzer for scintillation spectroscopy, single-component monitoring and proportional-counter pulse analysis. . . . Accurate delays of from 3 milliseconds to 30 seconds are said to be furnished with a time-delay relay made by **G. C. Wilson** (P35) for guided missiles and aircraft.

Surface temperature resistors available from **Trans-Sonics** (P36) can be attached with Mylar tape for temperature telemetering in ranges of -300 to 400 F. . . . A radar marker generator produced by **Advanced Electronics** (P37) is claimed to provide both range and azimuth pulses for radar testing and radar personnel training. . . . Two digital ohmmeters designed by **Non-Linear Systems** (P38) can be connected to digital recording systems to provide permanent records.

A 2,500-volt regulated power supply manufactured by **Kepco** (P39) is said to maintain output within 0.1 volt for loads from zero to 50 ma. . . . **California Chassis** (P40) has available all steel open-desk rack cabinets for mounting public address systems and transmitters. . . . **Magnovox** (P41) has developed a rocket-flight simulator which duplicates acceleration conditions of a two-stage flight during each test.

General Ultrasonics' (P42) stainless steel transducer provides 52 square inches of radiating area for tanks or vats used for cleaning, pickling and plating processes. . . . Labor costs are claimed to be reduced by using **Plummer's** (P43) Zippertubing as a substitute for cable lacing and tying in electronic equipment manufacture.

Bristol's (P44) pressure transducer for either airborne or ground applications is said to provide either linear outputs or any required curve for operation of control or measuring systems. . . . Flat selenium rectifiers, distributed by **Radio Receptor** (P45), are claimed to dissipate heat through conduction into the chassis and require less air space for cooling.

A uhf cavity amplifier by **Amtron** (P46) provides overall gain of 50 db from 300 to 400 mc and uses standard tuning capacitors. . . . Miniature precision potentiometers, designed by **Water** (P47) for printed circuits and automation assemblies where precise positioning is required, have a 3-prong base that fits standard 3-circuit microphone sockets. . . . Designed to operate BuOrd MK14 servomotors, **Feedback Controls'** (P48) model D-4 magnetic amplifier delivers 4 watts.

Continental Electric's (P49) phototube features extremely low current in darkness and is expected to have many applications in the field of instrumentation. . . . A sweep oscillator made by **Dynac** (P50) for laboratory use covers 5 to 5,000 cps in a continuous band. . . . Mass life tests of as many as 1,000 tubes, transistors, crystal diodes or resistors is said to be possible with the Model 815 life-test set made by **Systems Development** (P51).

The **Kocour** (P52) electronic thickness tester is claimed to measure the thickness of metal plate on steel, copper, brass and ceramics. . . . Designed to be snapped into place in a chassis, **Tinnerman's** (P53) speed clip is expected to reduce the time required to mount or replace crystal cannisters. . . . A 22.5-volt d-c power supply, designed by **Magnet Research** (P54) for such airborne applications as radio telemetering and instrumentation, is claimed to be free of line transients and to be short-circuit proof.

Production of 300 grams of single-crystal silicone or 1,000 grams of single-crystal germanium per day are claimed for **Precision Tool & Engineering's** (P55) crystal puller. . . . A tube checker by **Seco** (P56) makes tests of grid circuit, mutual conductance and cathode emission with a limited number of setup steps.

Waters Manufacturing (P57) has a line of panel meters encased in clear plastic to make full use of room lighting. . . . Adjustment between 3 and 120 seconds is possible without removing the dust cover of a time-delay relay available from **Belltron** (P58). . . . **Humphrey** (P59) offers a line of sector potentiometers designed for control and instrumentation systems in aircraft and missiles.

A sweeping oscillator covering a range of 10 to 145 mc, a variable-frequency marker and fixed markers are provided in an alignment instrument announced by **Kay Electric** (P60). . . . Sheath material of specially compounded silicone rubber is used in cables developed by **Hall-Scott** (P61) which are claimed to provide stable performance between temperatures of −85 and 410 F.

Short lengths of magnetic tape are used in **Burrough's** (P62) electronic filing unit to provide compact storage and rapid access to business information. . . . Measurement of the Q of r-f coils, capacitors, insulating materials and coil forms is possible with a Q meter announced by **Alpha Instruments** (P63). . . . Available in eight colors, **Sealectro** (P64) has press-fit miniature and subminiature terminals, test points and connectors.

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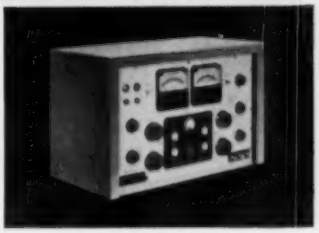
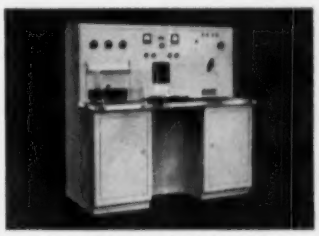
In addition to accuracy, each RFL Standard has many features which make rapid calibration procedure possible. Where many instruments must be tested, it is relatively easy to calculate the cost savings over older methods of calibration.



Model 829

Portable unit calibrates both AC and DC meters over ranges from 0.25 millivolts to 2000 volts and 2 microamperes to 20 amperes. Direct reading accuracy of 1% (0.5% using charts supplied). Frequency from 50 to 400 cps depending on line frequency.

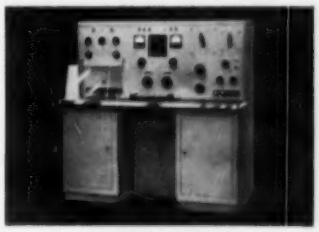
Net price $2,650. f.o.b. Boonton, N.J.



Model 261B

Calibrates all types of AC meters to direct reading accuracies of 0.5% (0.25% using calibration charts) over frequency range of 50 to 1600 cps. Current range from 1.5 milliamperes to 200 amperes; voltage range from 75 millivolts to 1500 volts. Output of electronic power oscillator has less than 5% total harmonic content at 60 cycles.

Net price $9,250. f.o.b. Boonton, N.J.



Model 262B

Calibrates DC electrical measuring instruments to direct reading accuracies of 0.1% (0.05% using calibration charts) through voltages ranging from 1 millivolt to 1500 volts and currents ranging from 1 microampere to 150 amperes.

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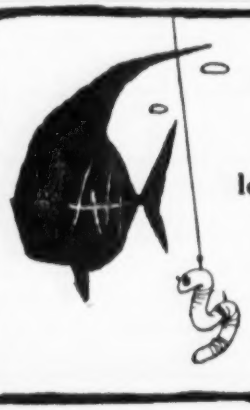

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Five series of r-f chokes available from **Waters** (P65) are claimed to provide high Q despite their small size. . . . Designed for laboratory and production meter calibration, **Kay Lab's** (P66) Model 100A-20 provides up to 1,000 volts at 200 ma. . . . A rate gyro available from either **U.S. Time** (P67) or **Sanders** (P68) is suitable for radar antenna, missile guidance and aircraft autopilot systems.

RCA's (P69) 6AW8A, a high-mu triode and sharp-cutoff pentode can be used in tv receivers as a video amplifier and a sync amplifier or sync clipper. . . . A line of nonsynchronous resistance-welding control panels announced by **GE** (P70) features plug-in units and hermetically sealed relays. . . . Indox V, a ceramic magnetic material developed by **Indiana Steel Products** (P71), can be used for d-c motors, traveling-wave tubes and loudspeakers.

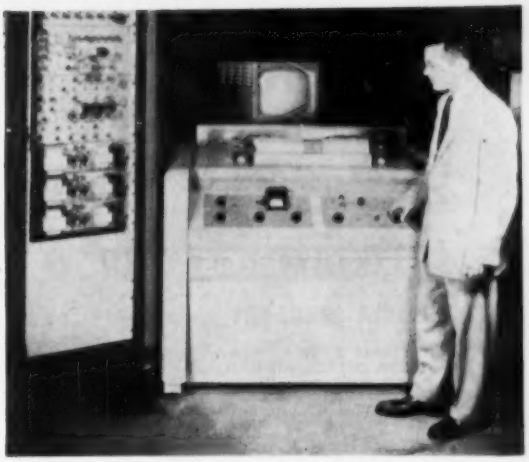
Production-line stripping of film-insulated wire should be faster with wire strippers made by **Ideal** (P72). . . . A test set developed by **Bendix** (P73) is adaptable for preflight checking of missile telemetering systems. . . . **Trans-Sonics** (P74) has resistance temperature pickups available with a claimed accuracy of 1 percent of full scale.

An **IBM** (P75) electric typewriter designed for use with data-processing systems automatically types 120 words a minute and is priced at $740. . . . Operation of fuel mixture and throttle controls on engine test cells, valve operation and remote manipulation in radio active locations are claimed by **Bristol's** (P76) electronic remote positioning system. . . . A kit of 18 high-Q toroidal inductors is offered by **Torocoil** (P77) for rapid assembly of prototype fillets.

Controlling temperatures by switching heating elements on and off is possible with a thermistor bridge circuit and contact meter relay announced by **Assembly Products** (P78). . . . A miniature toroidal coil-winding machine is made by **Harder** (P79) is said to high-speed production of toroidal components used in shift-register and computer memories.

VIDEO tape proves itself

Picture quality is adequate
Networks save money
More deliveries expected in '57



VIDEO tape recorder by Ampex may solve time-difference problems

LAST MONTH CBS put the Ampex Videotape Recorder in operation in Los Angeles. Regular usage has not been set yet, but more and more shows are getting the treatment. "We're putting it through its paces," says CBS.

Storing television shows as a signal on magnetic tape and replaying them on the air represents a new solution to the time difference problem between the East and West Coasts that plagued the networks.

During one trial run a technician took less than a minute to set up the tape for broadcast. Ordinarily, the "kine"—a film record made off the picture tube—takes at least twenty minutes.

Economy of time and personnel was only a small part of the victory. The picture quality itself was, according to CBS, superior to film.

William B. Lodge, CBS vice president in charge of engineering, is enthusiastic. "There are a few bugs to straighten out, but that's normal. It's brand new."

Here are Lodge's cost comparisons between kine and tape. An hour of film stock plus its processing: $350. For an hour of tape: $200.

CBS believes that a tape can be used somewhere in the neighborhood of 100 times. This being true, an hour of tape would cost $2.

The first models delivered were prototypes and not production output. CBS gets five, NBC three and the government five. These people were willing to pay $30,000 more rather than wait for the $45,000 production recorders. Ampex has 69 orders.

Phillip Gundy, Ampex vice president and director of the audio division says, "Final assembly of the Videotapes should begin next April or May at the rate of 20 a month. As for delivery, the company will only promise, "sometime in 1957."

CATV systems now number over 500

COMMUNITY ANTENNA television continues to boom. Even though threatened by the creation of new tv stations, the number of community master antenna systems has grown to more than 500. Industry experts say that there are some 600 more areas that fit the classic shape of communities suitable for CATV.

It is no longer only areas that receive inadequate or no tv signals in which expansion of community antennas is possible. Towns that get one or even two channels are supporting community antennas.

There is an apparent insatiable demand on the part of the public for as much tv as it can get.

FCC actions

Holders of uhf-tv permits who have not yet gone on the air have been asked by the FCC to explain their hesitancy. The Commission requested additional information from 83 of them. It wants to know whether or not there are extenuating circumstances that should be considered before their permits are cancelled.

AT&T has requested permission from the FCC to build $38-million worth of additional communications facilities. It wants to put in 3-million miles of long-distance telephone lines and 2.8-million miles of teletypwriter lines.

Hay Springs, Nebr. has been allocated channel 8.

Tv assignments have been changed in Massachusetts by the FCC. Channel 32 has been allotted to Greenfield, Mass. in addition to the one it already has, channel 58. Lowell, Mass. gets channel 78 and loses 32.

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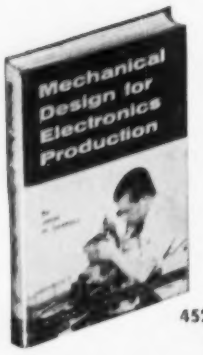

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STATION moves and plans

Internal Revenue has ruled that if a radio station fails to win a tv grant, it can deduct the expenses incurred in the attempt. The business expense has to be used in the year in which the grant is finally denied.

If the radio station does win a grant, all the expenses necessary from engineering to the cost of travel for witnesses must be capitalized as part of the investment. They are not business expense deductions.

KDON, Inc. bought KDON, Salinas, Calif. from Frank Oxarart, Inc. The price was $206,250.

Joseph S. Sample has applied to FCC for approval to buy 89.6 percent of KOOK radio and television, Billings, Mont. He will pay $403,650. At the moment, he is the president of the station and a minority stockholder. J. Carter Johnson heads the group selling out.

Rollins Broadcasting Inc. has opened its newest a-m station, WGEE, Indianapolis, Ind., joins the other Rollins outlets WNJR, Newark, N. J., WAMS, Wilmington, Del., WJWL, Georgetown, Del., WRAP, Norfolk, Va., WBEE, Harvey, Ill., and WPTZ-TV, Plattsburg, N. Y.

KSWS-TV will have the tallest tower in the country. Being constructed near Roswell, N. M., it will be 6,086 feet above sea level. It will be 1,610 feet from the ground on up. The former tallest tower was owned by KWTV in Oklahoma City. In a part of the country where bigness is common, it stood 1,572 feet high.

KEX, Portland, Ore., the last Westinghouse Broadcasting radio outlet to have a network affiliation, has gone independent. Formerly tied to the ABC network, it follows the path of the four Westinghouse stations which broke off from NBC last summer.

REEVES' new Mineola plant shows how Long Island provides . . .

Room to GROW

War-born industry matures
Aided by location advantages
Future expansion ensured

SUBURBAN LONG ISLAND, adjacent to New York City, is one of the largest electronics centers in the nation. About 35,000 people are employed. Sperry, with 18,000 employees, is the largest of more than 100 employers. There are dozens of small firms with less than 50 employees.

A wide variety of electronic equipment for both military and civilian use is manufactured, including radar and other detection devices, autopilots, fire-control mechanisms, guided missiles, computers, electron tubes, television parts and instruments.

World War II sparked the area's development as an electronics center. In the early war years Sperry moved to suburban Long Island and recruited and trained a large number of employees. A parallel growth of military aircraft manufacture provided additional impetus to electronics.

At the end of the war there were less than 40 electronics firms in the area. Today there are 120. Today's payroll is almost four times 1949's.

The industry can tap the labor supply of the Greater New York area. Almost 15 million people live here.

Space to build efficient one-story plants is an important advantage of the area. Many firms were originally located in New York City in crowded multistory quarters where they were unable to expand.

The ease of commuting to New York, attractive residential areas close to employment and many recreation spots are advantages in recruiting engineers.

In addition, Long Island is a self-contained market and supply center, with many prime and subcontractors in instrumentation, airplane and missile production.

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PATENT threat abroad

Secrets unpatented abroad declassified
May bar U. S. firms from overseas patents
Grounds are "prior publication"

DECLASSIFICATION of secret military electronic manuals dispersed around the world with U. S. forces poses a threat to electronic patent rights abroad, some American companies believe.

When a manual or document containing secret patentable data on file in the U. S. Patent Office is declassified a ticklish question arises: Does availibility of the declassified document constitute publication so far as many European patent offices are concerned? "This has become a very grave question," says Edward D. Phinney, vice president and general patent attorney of the International Telephone & Telegraph Co.

The way this question is answered by individual foreign governments determines whether U. S. firms are entitled to royalties abroad on some of their inventions.

The U. S. patent office has more than 2,000 applications on which patents are ready to be issued, except that they are marked secret and are therefore being held up. In addition there are about an equal number on file and being processed under a security lid.

An international convention allows patent application in any country abroad (except Argentina and certain small countries), within a year after filing with U. S. Patent Office, even though there has been a publication of the invention within that year. But what happens if the patent is a U. S. military secret for more than a year and is then made available abroad in a declassified document?

In France and many other countries prior publication anywhere in the world invalidates a patent. As a result, foreign companies can make use of these American patents without having to pay royalties.

When a secret manual is declassified an authorized holder of the manual is free to give it away to any foreign business man who wants the information.

BANKS need check handlers

LARGE POTENTIAL market for electronic data-processing equipment lies in the banking business. Bankers need help in handling a rapidly increasing volume of cancelled checks. An answer to their need for electronic check-handling equipment is in sight, 1,500 bank correspondents were told at a Chicago conference.

Automation has been hampered by lack of a common machine language, David H. Hinkel, of the American Bankers Association committee on electronics, said. Office equipment manufacturers have now promised to cooperate in seeking a solution, and prototype machines will be ready soon.

Banks need equipment to speedily read, sort, prove and post checks. Hinkel said manual check handling is their most serious operating problem today. Over 8 billion checks are written annually and the figure may rise to 14 billion by 1960.

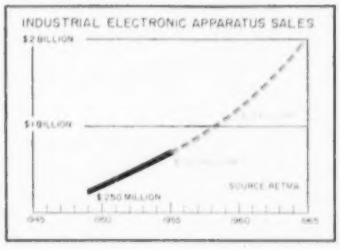
The ABA has selected a character-recognition method that would require manual handling by only the first bank to get a check. Magnetic-ink printing of control information would allow subsequent reading by electronic scanners.

Wanted: electronic VENDORS

VENDING MACHINES are growing up. An estimated 3,217,000 machines now dispense $1.9 billion in products annually. Large ones carry up to $250 worth of electrical and electronic equipment. Shipboard vendors carry $40 to $60 in added electronic components to prevent relay and switch action from interfering with radar and radio.

Elmer Johnson, chief research engineer for Vendo Corp., says vendors will need electronic equipment to count cash and make change, keep sales inventories on computer tape and cook a variety of foods quickly with high-frequency radar.

Our stake in CONTROLS



INDUSTRIAL CONTROL is gaining increasing importance as an electronics market. Many automatic control devices are now all electronic. Others require amplifiers and computers.

RETMA reports a climb in industrial electronic apparatus sales from $250 million in 1948 to $700 million in 1955. It predicts $1.2 billion in 1960 and $2 billion in 1965 "through the stimulus of automation."

Many reasons are behind the expectations. Manufacturing competition demands reductions in shrinkage and labor costs.

Automatic control is not new. It has long been a necessary tool of the continuous process industries such as chemicals, oil and biologicals. Rugged, time-tested electrical, pneumatic, hydraulic, and mechanical controls have been the mainstay.

Let's face it!

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☐ **Call your local** Civil Defense Director. He'll help you set up a plan for your offices and plant—a plan that's safer, because it's integrated with community Civil Defense action.

☐ **Check contents** and locations of first-aid kits. Be sure they're adequate and up to date. Here, again, your CD Director can help. He'll advise you on supplies needed for injuries due to blast, radiation, etc.

☐ **Encourage personnel** to attend Red Cross First-Aid Training Courses. They may save your life.

☐ **Encourage your staff** and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads and official CD films or literature that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building prestige and good community relations—and no greater way of helping America.

Act now . . . check off these four simple points . . . before it's too late.

BRITISH computers hit $40 million

Explore small business market
More than 200 machines on order
Predict $84 million by 1958

A PERIOD of rapid expansion is underway in Britain's computer manufacturing industry. British companies have orders for more than 200 computing machines and auxiliary equipment. Value: about $40 million.

Ten British companies presently manufacturing electronic computers anticipate 1958 orders for 300 to 400 machines valued at more than $84 million, including sales and rentals. An increased number of firms in the field is also expected.

An example of a newcomer to Britain's computer field is J. Lyons and Co., a caterer, restaurant owner and food distributor. Unable to get the type of computer it wanted, Lyons gathered its own small corps of engineers, adapted a Cambridge University computer and came up with Leo I and then Leo II.

Despite the growth trend, computer development in the United Kingdom still lags behind that of the United States. Both analog and digital types are being developed and produced, but there have so far been few developments to rival their American counterparts.

In Britain the greatest initial large-scale uses of computers are probably for small business computers. These will supplement the work of more than two million clerks employed in accounting departments all over Britain. The city of Norwich in Norfolk will install a fully-electronic billing system for public utilities, as well as for handling the payroll for municipal employees.

Ferranti estimates its current annual sales of computers at about $1.7 million and hopes to jump that to between $5.5 and $8.5 million in a year and a half.

P. D. Hall, Ferranti's commercial manager, says his company's major computer expansion will be in machine-tool control and automatic devices and in the small-business computing field.

Ferranti lists three lines of computers: the Mark I, a large cathode-ray-storage scientific model priced around $280,000; the Mercury, a large scientific machine, also selling for about $280,000; and the smaller Pegasus, priced at around $140,000. The latter machine can be used alternatively for scientific or business-data processing.

Developments ABROAD

A British electronic heart and lung machine for use in cardiac surgery is being manufactured on a commercial scale by New Electronic Products Ltd., London, and orders are being received from hospitals in Europe and the U. S. The machine was conceived by D. G. Melrose of the post-graduate Medical School of London and is housed in a trolley measuring 3 by 3 by 2 feet. It consists of an oxygenator which takes over the function of the lungs, the pumps which maintain artificial blood circulation and an electronic control unit.

Sylvania Electric and Britain's Thorn Electrical Industries have jointly opened a new color-tv factory at Enfield, Middlesex, England, aimed at developing a new and better type of tube and to bring color television to the British public.

British food canner, Batchelor Peas Ltd., is building a $7-million factory that will have more than 100 electronic pea and bean grading machines and a fast-filling canning system. Production is expected to begin in July.

Five transmitting stations for the Portuguese television network are scheduled to be in operation this year. Radiotelevisao Portuguesa, which received the network operating concession from the government, has awarded three equipment contracts to European firms. Siemens of Germany received a $595,000 order for transmitters and antennas; the French Compagnie de Telephonie S. F. received a $245,000 contract for link equipment, and the Dutch firm of Philips was given a $490,000 contract for studio equipment and vehicles.

Canada's newest and largest magnetron plant, completed last year by the Canadian Marconi Company, Ltd. at a cost of $1.5 million, is now reaching full production in the Town of Mount Royal, north of Montreal. The immediate production goal will be to answer Canada's demand for magnetrons for defense and civilian radar uses. First types will operate in the microwave frequency ranges around 1,000, 3,000 and 10,000 megacycles.

EXPORTS and IMPORTS

German-produced electronic equipment appears to be fast overtaking that of U. S. manufacture in prestige and popularity througout Morocco. Importers say German inroads are mounting in record players, radio sets, transistors, tape recorders and broadcast equipment.

Radio stations in the Tangier zone that have American equipment complain they must wait eight months to more than a year for new parts or replacements.

European radios, large, small or portable, receive two or three broadcast bands rather than the single medium-wave broadcast band of American radios. The Germans are furnishing such sets.

Germans are giving better deliveries and quoting better prices. They answer their mail promptly while Americans slip in this. When sending instructions or answering a query the Germans send entire books, plans, photos and explanations while Americans generally send a few sheets of literature.

Brazil's Varig Airlines has ordered Bendix C-band airborne weather radar equipment for its Constellation fleet and will also install Bendix C-band units on its Lockheed aircraft now on order.

Britain is producing a great number and variety of ferrites, and an export trade in them is being built up, according to the British Information Services. An exchange of ideas at a recent International Convention on Ferrites in London is expected to have significant effects on the manufacturers of ferrites.

Eletromar Industria Eletrica Brasileira S. A., Rio de Janiero, a major Brazilian electrical equipment manufacturing and distributing firm, and Sola Electric of Chicago have signed a license and engineering agreement. Eletromar is licensed to manufacture electrical equipment utilizing Sola engineering and research data, designs and patents. Included are constant voltage transformers and regulated d-c power supplies now made by Sola.

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PLANTS and PEOPLE

NEW team Axler, Geller and McMorrow chart Waltham's course as . . .

More COMPANIES jump in

A RASH of diversifying companies are jumping into the electronics field, or going into it deeper. They range from watchmakers to vacuum-cleaner manufacturers. The management of Waltham Watch, for example, plans an enlarged development program in aircraft instrumentation. The Massachusetts company already makes gyroscopes, synchros, servo systems and special instruments.

Management team of new Waltham president Joseph Axler consists of M. A. Geller, Melvin Axler and Irving Stolz in top executive jobs. They bought controlling interest in the watch company from a Philadelphia bank, realigned its sights. Former president William H. McMorrow is now board chairman, will oversee the expanded program.

The Hoover Co. of North Canton, Ohio, manufacturer of electrical appliances, bought Baltimore's tiny Phebco Inc. a little over a year ago. Now they have changed its name to Hoover Electronics, and are building a $1.5-million plant in Timonium, Md., 15 miles north of Baltimore, to house its facilities. By the end of summer, 30,800 sq ft of the 110,000-sq ft building will be ready for occupancy. The subsidiary corporation will specialize in instrumentation and control equipment.

The Borden Company's subsidiary, Resin Industries, has acquired a 21,000-sq ft plant in Leominster, Mass., for the manufacture of electronic insulation materials. Initial production begins this month, with peak production goals set for year's end. The new plant serves Resin's eastern customers. It duplicates existing facilities in Santa Barbara, Calif.

Link Aviation begins operation this month of a Palo Alto laboratory for design and development of electronic computer systems, with emphasis on transistor circuits. Link also plans to open a larger lab facility in Stanford Industrial Park.

AVCO reorganizes

CROSLEY division of Avco has been reorganized following the elimination of radio and tv sets and appliances from the Avco line. The designations Crosley Home Appliances and Crosley Government Products have been dropped. Four new division posts have been filled.

All research, development, product engineering and sales of the Crosley division are administered by Avco vice president Clarence Felix. John Mihalic becomes vice president and director of manufacturing, Harold Tipping is now director of industrial relations and George Schafstall is division controller.

Avco is now beginning work on a 400,000-sq ft research and development center in Wilmington, Mass. The $15-million project, to be finished next year, will investigate man-carrying earth satellites and missiles control systems.

SPERRY RAND grows

OPERATIONS of broadly diversified Sperry Rand are spreading out some more. Sperry Gyro has occupied the second of its buildings in the Sunnyvale, Calif. development center. The 20,000-sq ft facility gives Sperry engineering

Executive MEETINGS

Jan. 28-31: West Coast General Management Conference, Hotel Statler, Los Angeles.

Feb. 13-15: Midwinter Conference on Personnel Management, Palmer House, Chicago.

Feb. 18-20 and Mar. 20-22: AMA Seminar on Managing R&D Efforts, Sheraton-Astor, N. Y.

Feb. 25-27: Annual AMA Electronics Conference, Hotel Statler, N. Y.

Mar. 18-21: IRE National Convention, Waldorf-Astoria, N. Y.; and First Military Automation Exposition, N. Y. Trades Show Building.

space for work on classified weapons systems.

Work continues at the new Sperry Phoenix division in Phoenix, Ariz. The 81,000-sq ft plant now going up there will cost over $3 million, should be finished in August. Phoenix operations have already begun in 14,000 sq ft of space at the state fair grounds. Sperry Phoenix will build flight and engine controls.

Sperry Rand's Univac gets a new general sales manager. James A. Finigan Jr., one-time sales representative for the computermaker's Washington accounts, takes over sales management of the commercial Univac systems.

BAKELITE shuffles managers

BAKELITE COMPANY, division of Union Carbide, has appointed two new executives for sales and marketing, and realigned its organization into five production groups.

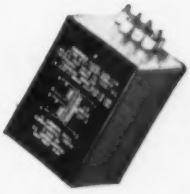
C. W. Blount, former vice president in charge of sales, becomes vice president for marketing, and J. D. Benedito moves up from general sales manager to vice president for sales. Meanwhile, five new general managers were given complete responsibility over the five product lines: A. W. Downes for new resins and compounds; A. A. Boehm for phenolics; C. M. Blair Jr. for polyolefines; J. E. Brister for polystyrene resins and compounds; and R. D. Glenn for vinyl resins and compounds. All five move up from within the plastics company.

M-H top post goes to Brown exec

MINNEAPOLIS-HONEYWELL'S activities in industrial controls are now being directed by Brown Instruments' president Henry F. Dever. Dever, who is a long-term M-H executive, will continue to head the instruments division. He will plan, coordinate and control activities of the seven M-H divisions from his headquarters in Philadelphia.

The move indicates new emphasis on electronics for the regu-

NEW FAST SERVICE



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lator company. Brown has been working closely with a recent M-H acquisition, Davies Laboratories of Beltsville, Md., makers of data-recording systems.

PHILCO has new officers

RESHUFFLE at Philco has produced some new officers and a realignment of responsibility at the top. The realignment, announced by president James M. Skinner Jr. at year's end, had been under consideration since fall as part of Philco's general effort to firm up its management structure.

Four executive vice presidents now guide policy for the Philadelphia corporation. John M. Otter, who was already an exec, is now responsible for all phases of marketing. Research and engineering v-p Leslie J. Woods is now an executive vice president with the same functions. Larry F. Hardy, general manager of Philco's consumer products divisions, moved up to be an executive v-p controlling the same activities. Former manufacturing vice president Joseph H. Gillies is the new operations exec.

At the same time, former Raytheon vice president Henry F. Argento moves in to take command of Philco's increasingly important Government and Industrial division. Argento's responsibility will include running new Philco subsidiaries Lansdale Tube Co. and Sierra Electronics. He succeeds James D. McLean (no kin to Sidewinder project head William McLean). McLean resigned from Philco to become president and general manager of Hoffman Laboratories, engineering subsidiary of West Coast t-v maker Hoffman Electronics.

BELL gets reactor

AIR FORCE will give a nuclear reactor to Bell Laboratories. The reactor, which will be built at Whippany, N. J., will permit Mother Bell to study the electrical, magnetic and structural properties of solids and the effects of radiation on electronic components and systems. Limited research in these fields is already done by Bell at Long Island's Brookhaven National Laboratory.

Construction of the reactor will begin this year, and will be completed in 1958. The Air Force is also giving a 3-million-electron-volt Van de Graaff accelerator to the Labs.

TI closes ranks

TWO TEXAS INSTRUMENTS subsidiaries become operating divisions as a result of an organizational change. Houston Technical Laboratories, maker of geophysical and industrial instruments, changes its name to become the Industrial Instrumentation division of TI. Wm. I. Mann Co., Monrovia, Cal., manufacturer of precision optical equipment, is now called the Optics division.

Executive MOVES

TWO DAYS after Chicago's Junior Association of Commerce and Industry named him the city's "outstanding young man" for 1956, **Robert W. Galvin** became president of Motorola, succeeding **Paul Galvin**, who becomes board chairman but keeps the reins as chief executive officer.

Audivox production v-p **Rolf Stutz** moved into the presidency, advancing **Andrew Propper** to board chairman, and pulling chief engineer **Warren Walters** into his former job.

A-bomb scientist **Leo Szilard** was hired by Unitronics Corp. as special consultant to direct development work on electronic food-preservation.

Borg-Warner's presidential assistant **Henry M. Haase** moved up to engineering and research v-p.

Permo Inc. created the job of assistant sales manager, dropped **Hiram Prince** into the slot . . . Panellit general sales manager **Millard Shriver** was elected vice-president for sales . . . Centralab has a new general sales manager in the person of **W. E. Peek.**

Avco v-p **Harvey Williams** moved to Philadelphia as president of Philco International.

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant
Positions Wanted
Part Time Work
Civil Service Opportunities
Selling Opportunities Wanted
Selling Opportunities Offered
Employment Agencies
Employment Services
Labor Bureaus

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The advertising rate is $25.25 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.
Subject to Agency Commission.

$2.40 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.
Box Numbers—counts as 1 line.
Position Wanted ads are ½ of above rate.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.
Not subject to Agency Commission.

Send NEW ADS or Inquiries to Classified Advertising Division of ELECTRONICS, P. O. Box 12, N. Y. 36, N. Y.

Microwave Design Engineer

to $12,000

Capable of design and development of microwave components. Background in antennas, couplers, mixers, oscillators, phase shifters, TR devices or similar complex electronic components desired.

You'll work at General Electric's 4-year old Light Military Electronic Equipment Department, the department that has made so many contributions in the field of advanced military electronics . . .

Location: Utica, N. Y., at the very gateway to the Adirondacks, center for outdoor recreational activity all 4 seasons of the year.

To arrange a session of mutual consultation, write in confidence to:

Mr. John Sternberg, Dept. 845
Light Military
Electronic Equipment Dept.
GENERAL ELECTRIC
French Road, Utica, N. Y.

E. E. SALES REPRESENTATIVE
ELECTRONIC & NUCLEONIC INSTRUMENTS

Leading manufacturer of transistorized electronic devices and nucleonic radiation detection instruments seeks experienced, capable rep. Now selling non conflicting allied lines to hot labs, hospitals, universities, reactors, civil defense. Drawing account plus commission. Excellent future. **Universal Atomics Corp.**, 143 East 49th Street, New York 17, N. Y.

MANUFACTURERS' REPRESENTATIVES
IN THE ELECTRONIC INDUSTRY
CONTRACT RATES GIVEN ON REQUEST. WRITE:
ELECTRONICS

FRED F. BARTLETT & CO.
Electronic Instrumentation
PA.(E) • N.J.(S) • DEL. • MD. • D.C. • VA.
160 Marlyn Ave., Bryn Mawr, Pa.
LAwrence 5-7030

Research Scientists

At the AVCO *Research Laboratory* a young, creative scientist can find satisfaction in a small, youthful, progressive laboratory which is moving rapidly along in the modern, scientific world.

Integrated here in a university-type atmosphere are the fields of physics, aerodynamics, and physical chemistry. You derive individual satisfaction working in these broad areas of knowledge in intimate contact with a top-notch scientific group. You receive individual recognition for your contribution for a new understanding of scientific fundamentals through publication of research results in the standard journals.

The *Research Laboratory* is engaged in the study of gases and gas dynamics at high temperatures. We are interested in the phenomena accompanying the dissociation and ionization of gases and in the application of these phenomena. Future plans call for research in non-competitive fields for application to defense and commercial products.

There are many more satisfactions to be derived from a research career with the AVCO *Research Laboratory*, including excellent salaries, promotion on merit (individual achievement), and an exceptional benefits program with retirement provisions and an educational aid plan (pays full tuition).
Relocation expenses paid.

If you are interested in genuine research activity and have related research experience, you will be interested in these positions:

Jr. Scientists — Degree in Physics or Aerodynamics.

Associate Scientists — Degree in Aerodynamics.

Sr. Scientists — Degree in Physical Chemistry or Physics or Mathematics or Electronics.

Sr. Electronic Physicist — Advanced Degree in Physics or Electrical Engineering to lead a group which invents, designs, and develops electronic research techniques for the Laboratory.

Interviews at the Hotel New Yorker during meetings of American Physical Society and American Association of Physics Teachers Jan. 30-Feb. 2, 1957. If these interview dates are not convenient, send resume to Mr. Robert M. Hale.

AVCO RESEARCH LABORATORY
A Unit of the Research and Advanced Development Division AVCO MANUFACTURING CORP.
2362 Revere Beach Parkway
EVERETT, MASSACHUSETTS

Industry to help REPS

A trend toward closer cooperation between manufacturers and their channels of distribution is shaping up in the industry. The tightening market is encouraging parts and equipment makers to give more sales aid to reps, train them to do their selling jobs, support them with adequate financing.

"Shoestring distribution ventures," says Sylvania's Don Mitchell "will not be successful in the critical period ahead." The scramble for business will force industry to back up the reps, should encourage reps to feel more responsible toward their principals.

Manufacturers must train their own sales organizations and educate their distributors, says J. A. Milling, president of Howard W. Sams Co. "We can make better businessmen," Milling told the Electronic Parts and Equipment Manufacturers Association, "by doing a better training and selling job ourselves."

Underwood Corp.'s Electronic Computer division set up a distribution organization for its electric delay line. Seven reps will cover the country. The sales network is made up of Cooper-Simon, New York; Vaen Associates, Tarrytown, N. Y.; Floyd Faucett, Atlanta; Martin Friedman, Philadelphia; Arthur J. Schubert, Skokie, Illinois; M. B. Gilbert, Los Angeles; and Wayne Palioca, Concord, Mass.

Components Corp., Denville, N. J., appointed Frank B. Koessler, Los Angeles, rep for the far West, and C. H. Lucas, Dallas, for the Southwest.

Other DISTRIBUTION news

University Loudspeakers of White Plains, N. Y., now merchandises its products in Salt Lake City through Leon S. Bush.

Denver Engineering Sales recently undertook distribution of the tubing, wire and cable of the William Brand Company, Willimantic, Conn.

Seattle rep Don Smith now distributes International Electronic Research's tube shields.

ElectroData division of Burroughs set up four regional marketing areas to handle sales for its electronic computer line. **Avien** will merchandise its instruments and control systems in Canada through Brian Engineering Ltd., Montreal.

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About our TECHNICAL Edition . . .

A method for broadcasting tv sound on the visual carrier is described in the January 1, 1957 edition of ELECTRONICS, by Wolfe. Used at WAAM-TV in Baltimore in the event of sound carrier failure, the system uses a miniature vhf transmitter and a detector-amplifier and can be set up for less than $700. Mixing and rectifying the audio and video carriers from the miniature transmitter provides a demodulated envelope, which is used to modulate the station visual transmitter.

Finding pipes or ducts in building walls and floors is possible with a detector described by Todd of GE in the January 1 edition. Said to cost only $15 for parts, it incorporates a transistor oscillator. When the tank coil is brought near metal, the frequency of the oscillator changes.

A technique for modifying resistance potentiometers as sensing elements in transducers is explained by Dimeff and Fryer of Ames Aeronautical Laboratory in our February 1 edition. An electrostatic coupling, which improves resolution and linearity and reduces hysteresis, is substituted for mechanical contact by separating the contactor from the resistance element.

THE EDITORS

electronics READER SERVICE CARD

FOR ADDITIONAL INFORMATION ON ADVERTISEMENTS AND NEW PRODUCTS

Here is How to Use the Card!

WANT MORE INFORMATION ON ADVERTISEMENTS?

For more information on an advertisement, circle page number of advertisement in section A on the reader service card (below).

If there is more than one advertisement on the page, the position of the ad will be indicated by letters following the page number. The letters following the page number will indicate the ad's positions: R-Right, RT-Right Top, RB-Right Bottom, L-Left, LT-Left Top, LB-Left Bottom, M-Middle, MT-Middle Top, MB-Middle Bottom (i.e. 230L). Diagrams on back of this page show how to use the key.

On pages with no number such as bleed pages, count from the last numbered page to find the number. Inserts are numbered using last numbered page plus A, B, etc. If you are not sure of a page number, consult the advertisers index.

WANT MORE INFORMATION ON NEW PRODUCTS?

Each New Product item in ELECTRONICS has a number (P1, P2, etc.) Circle the corresponding number in section B of the Reader Service Card (below).

YOUR ACCURACY ASSURES CORRECT REPLIES

There are two cards for your convenience. Use one, or both if necessary. Print carefully, then tear off and mail. We are unable to process cards where name and address is illegible.

See Fractional Page Diagram on Other Side of This Page!

FILL IN NAME, POSITION, COMPANY & ADDRESS HERE

FOR ADDITIONAL INFORMATION ON AN AD, CIRCLE CORRECT NUMBER IN SECTION A

NEW PRODUCT INFORMATION? USE SECTION B

JAN 20·57
CARD EXPIRES APR. 20TH

• electronics • READER SERVICE CARD

Please Print Carefully

NAME POSITION

COMPANY

ADDRESS

SECTION A

4	9	12	24	29	35	38	3rd Cover
7	10	18	25	31	36T	45T	4th Cover
8	11	23	26	33	36M	2nd Cover	

SECTION B — CIRCLE FOR NEW PRODUCTS HERE!

P1	P6	P11	P16	P21	P26	P31	P36	P41	P46	P51	P56	P61	P66	P71	P76	P81	P86	P91	P96
P2	P7	P12	P17	P22	P27	P32	P37	P42	P47	P52	P57	P62	P67	P72	P77	P82	P87	P92	P97
P3	P8	P13	P18	P23	P28	P33	P38	P43	P48	P53	P58	P63	P68	P73	P78	P83	P88	P93	P98
P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P99
P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

TEAR HERE!

FILL IN NAME, POSITION, COMPANY & ADDRESS HERE

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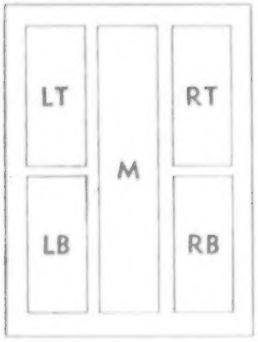
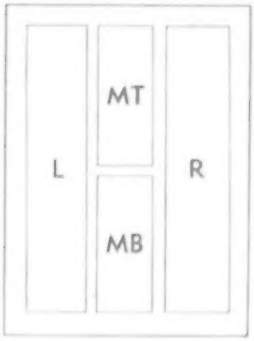
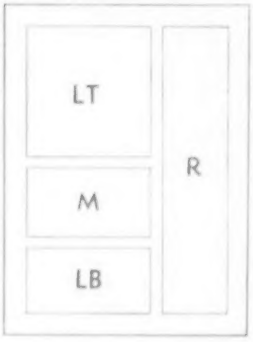
P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P99
P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

DIAGRAMS BELOW SHOW HOW TO USE THE KEY

ON PAGES WITH MORE THAN ONE ADVERTISEMENT







FIRST CLASS
PERMIT NO. 64
(Sec. 34.9 P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ Postage Will Be Paid By

ELECTRONICS
Reader Service Dept.
330 West 42nd Street
New York 36, N. Y.

FIRST CLASS
PERMIT NO. 64
(Sec. 34.9 P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ Postage Will Be Paid By

ELECTRONICS
Reader Service Dept.
330 West 42nd Street
New York 36, N. Y.

On pages with more than one advertisement, the page number PLUS the correct letters (as shown above) are necessary to indicate the POSITION of the advertisement.

You must circle the page number with the correct letters after it (i.e. 240 L, which means page 240 Left).

USE THIS KEY:

R—Right

RT—Right Top

RB—Right Bottom

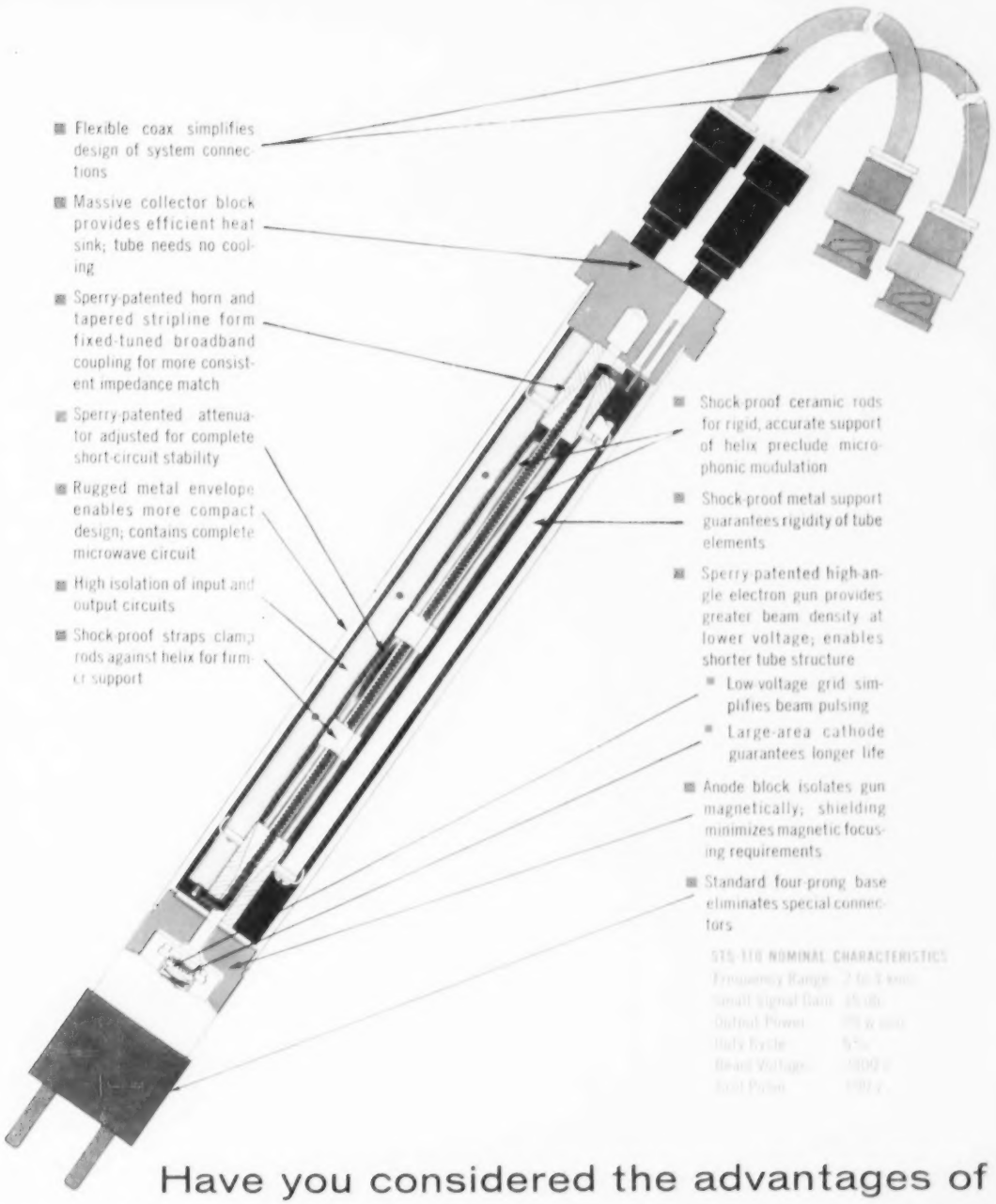
L—Left

LT—Left Top

LB—Left Bottom

M—Middle

MT—Middle Top


Flexible coax simplifies design of system connections
Massive collector block provides efficient heat sink; tube needs no cooling
Sperry-patented horn and tapered stripline form fixed-tuned broadband coupling for more consistent impedance match
Sperry-patented attenuator adjusted for complete short-circuit stability
Rugged metal envelope enables more compact design; contains complete microwave circuit
High isolation of input and output circuits
Shock-proof straps clamp rods against helix for firmer support
Shock-proof ceramic rods for rigid, accurate support of helix preclude microphonic modulation
Shock-proof metal support guarantees rigidity of tube elements
Sperry-patented high-angle electron gun provides greater beam density at lower voltage; enables shorter tube structure
Low-voltage grid simplifies beam pulsing
Large-area cathode guarantees longer life
Anode block isolates gun magnetically; shielding minimizes magnetic focusing requirements
Standard four-prong base eliminates special connectors

STS-110 NOMINAL CHARACTERISTICS

Frequency Range ..... 2 to 4 kmc
Small Signal Gain ..... 45 db
Output Power ..... 100 w min
Duty Cycle 5%
Beam Voltage ..... 1800 v
Anod Pulse ..... 1800 v

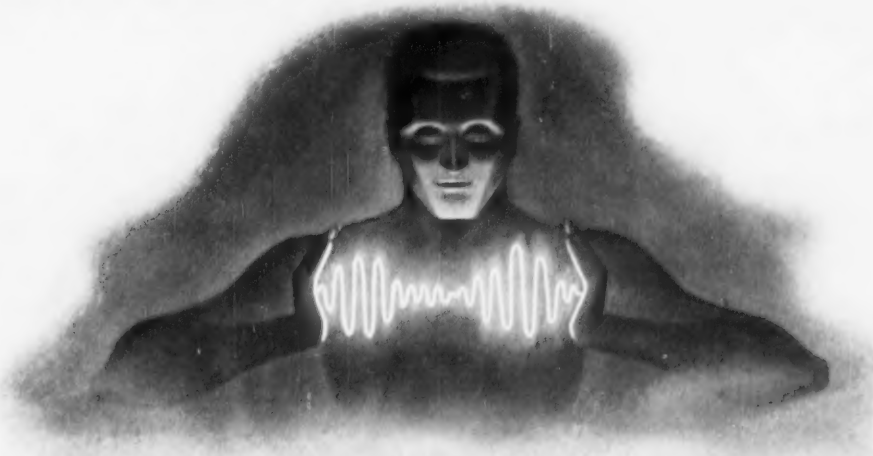
Have you considered the advantages of

Sperry ALL-METAL travelling wave tubes?

The new Sperry *all-metal* travelling wave tube shown here in cutaway form was produced to provide the driving power for multi-megawatt klystrons used in defense radars. Its characteristics, however, open the door to unlimited new applications. Being made of metal, this Sperry travelling wave tube is *rugged*—withstands far greater shock and vibration than any previous tube. *Electrical characteristics are better*, providing excellent phase stability. And from the system engineer's standpoint, *application is simpler*. Sperry's all-metal travelling wave tubes conform to your design, eliminating the necessity of designing to conform to the tube. A new data sheet on the STS-110 is yours for the asking and our Electronic Tube Sales Department will gladly give you information relating this new development to your specific projects.

SPERRY *Electronic Tube Division*
GYROSCOPE COMPANY
Great Neck, New York
Division of Sperry Rand Corporation

SPERRY GYROSCOPE COMPANY, NEW ORLEANS • LOS ANGELES • SEATTLE • SAN FRANCISCO • HONOLULU • SPERRY GYROSCOPE COMPANY OF CANADA, LTD., MONTREAL, QUEBEC



Through the magic of photoelectronics —RCA Tubes work wonders with light

Like a modern genie of Aladdin's tales, RCA photosensitive devices are putting light to work in amazing ways to control, inspect, measure, guard—efficiently, speedily, and economically.

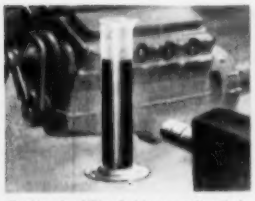
In industrial television, for example, RCA TV camera tubes are helping to improve product quality, increase production, train personnel, protect life and property—extending human vision into places heretofore impractical or too hazardous for man to work.

In work with invisible radiation, RCA Multiplier Phototubes are used in devices to: Simplify geophysical surveys... determine thickness of materials...conduct atomic particle research (an RCA Tube helped in the discovery of the antiproton)...study material flow, growth of organisms, wear of machinery, and effectiveness of chemicals through radioactive tracer techniques.

In control work using light, RCA Phototubes and Photosensitive Cells are serving as "electronic switches" to help industry: Turn street lights and display signs on and off..."read" film soundtracks and computer punch cards...measure light, and compare colors...inspect, sort, and route materials.

And this is just an inkling of the myriad applications in which RCA photosensitive devices are used in industry, medicine, and science. If you see where photoelectronics holds a special promise in your operations, we will be glad to put you in touch with organizations specializing in photoelectronic equipment. Simply write RCA Commercial Engineering, Section A19Q3 Harrison, N. J.

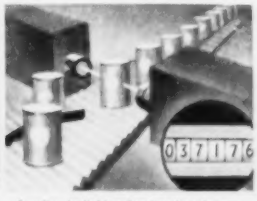
RCA **ELECTRON TUBES FOR INDUSTRY**
RADIO CORPORATION OF AMERICA TUBE DIVISION



Checking durability of pistons — radioactively treated — by measuring radioactivity of worn particles deposited in the oil

Safe-guarding property at night — more reliably than with the eye

Safely monitoring hazardous operations — with small, industrial TV cameras



Counting by light and sorting by color — fast and accurately

Controlling streetlights, signs, headlights — automatically